TOYS FROM TRASH

ARVIND GUPTA

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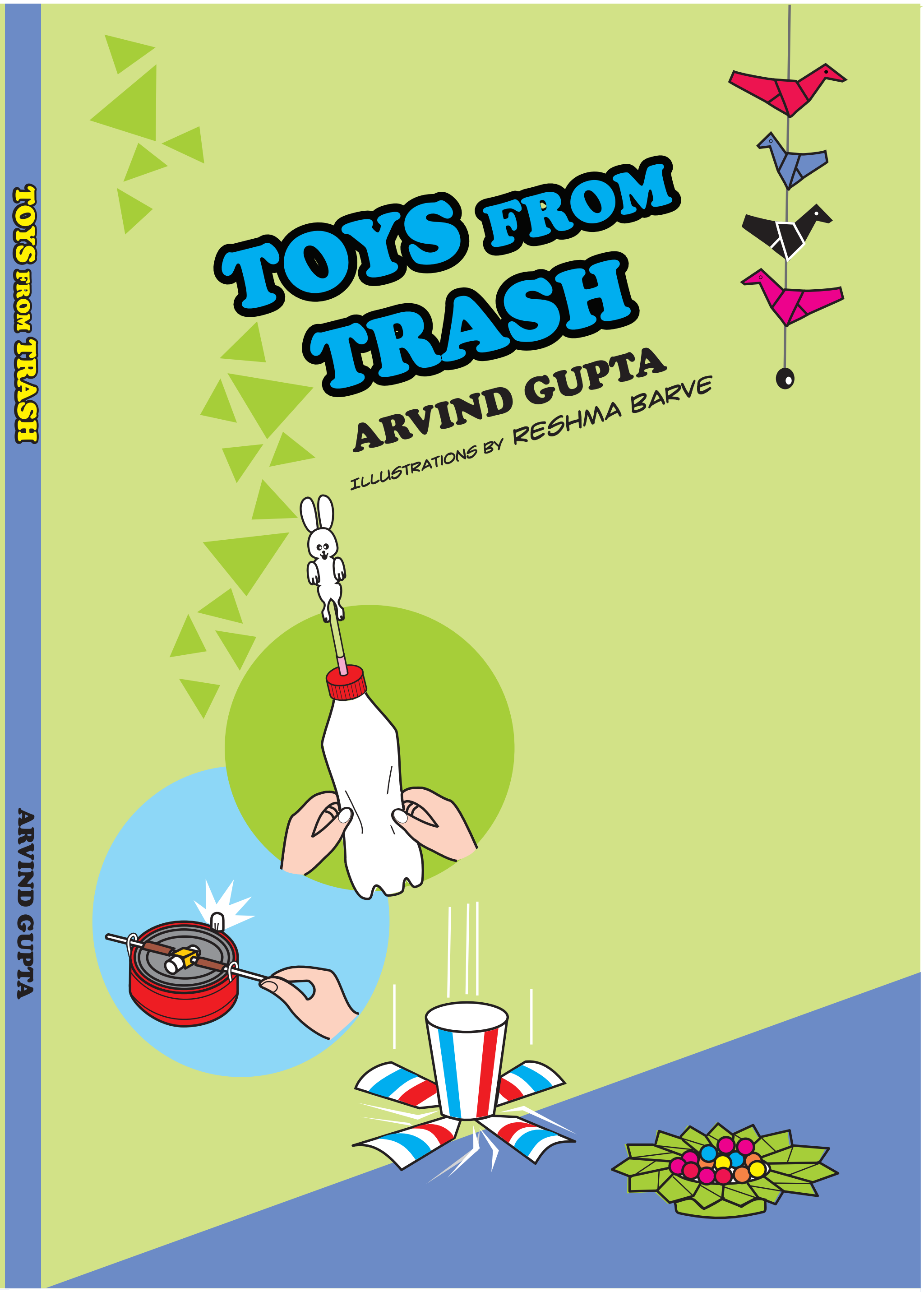
ILLUSTRATIONS BY RESHMA BARVE



ARVIND GUPTA graduated from the Indian Institute of Technology, Kanpur (1975) with a degree in Electrical Engineering. He has written 15 books on science activities, translated 140 books into Hindi and presented 125 films on science activities on *Doordarshan.* His first book *Matchstick Models & Other Science Experiments* was translated into 12 Indian languages and sold over half a million copies. He has received several honours, including the inaugural *National Award for Science Popularization amongst Children* (1988), *Distinguished Alumnus Award of IIT, Kanpur* (2000), *Indira Gandhi Award for Science Popularization* (2008) and the *Third World Academy of Science Award* (2010) for making science interesting for children. Currently he works at IUCAA's Children's Science Centre, Pune, and shares his passion for books and toys through his popular website http://arvindguptatoys.com

RESHMA BARVE studied Commercial Arts at the Abhinav Kala Mahavidyalaya, Pune. She is a freelance artist and designer and has illustrated many children's books.

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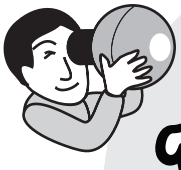

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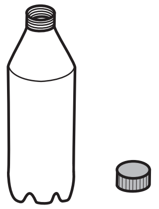
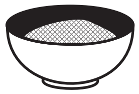
SAND
SUCKS



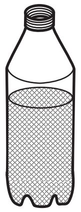
PLASTIC BOTTLE



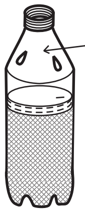
COARSE SAND

WATER

1 FILL 3/4 BOTTLE WITH SAND.

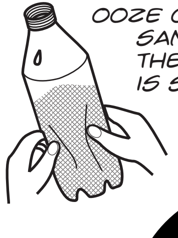


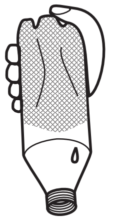
2 ADD WATER UNTIL THE SAND IS SATURATED.



ADD SOME MORE WATER SO THAT A LITTLE FLOATS ON TOP.

3 ON PRESSING THE BOTTLE, MORE WATER SHOULD OOZE OUT FROM THE SAND. INSTEAD, THE EXTRA WATER IS SUCKED IN!!

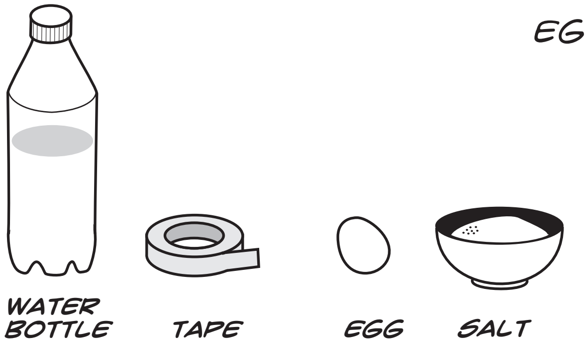




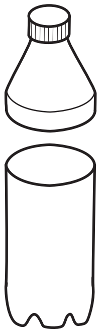
4 TURN THE PRESSED BOTTLE UPSIDE DOWN. SURPRISINGLY, NO WATER FALLS!!!

ON PRESSING, THE SAND STRUCTURE BREAKS CREATING INNER CAVITIES THAT SUCK IN THE EXTRA WATER.

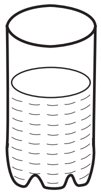
EGG IN BOTTLE



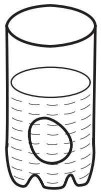
❶ CUT BOTTLE 10-CM FROM TOP.



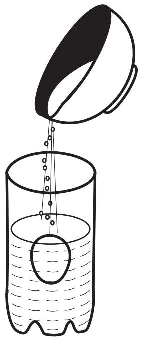
❷ FILL IT WITH TAP WATER.



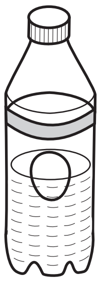
❸ A FRESH EGG WILL SINK IN TAP WATER.



❹ ADD SALT AND KEEP STIRRING. ADD ENOUGH SALT SO THAT THE FRESH EGG FLOATS.



❺ ATTACH THE TOP PART OF THE BOTTLE WITH TAPE.

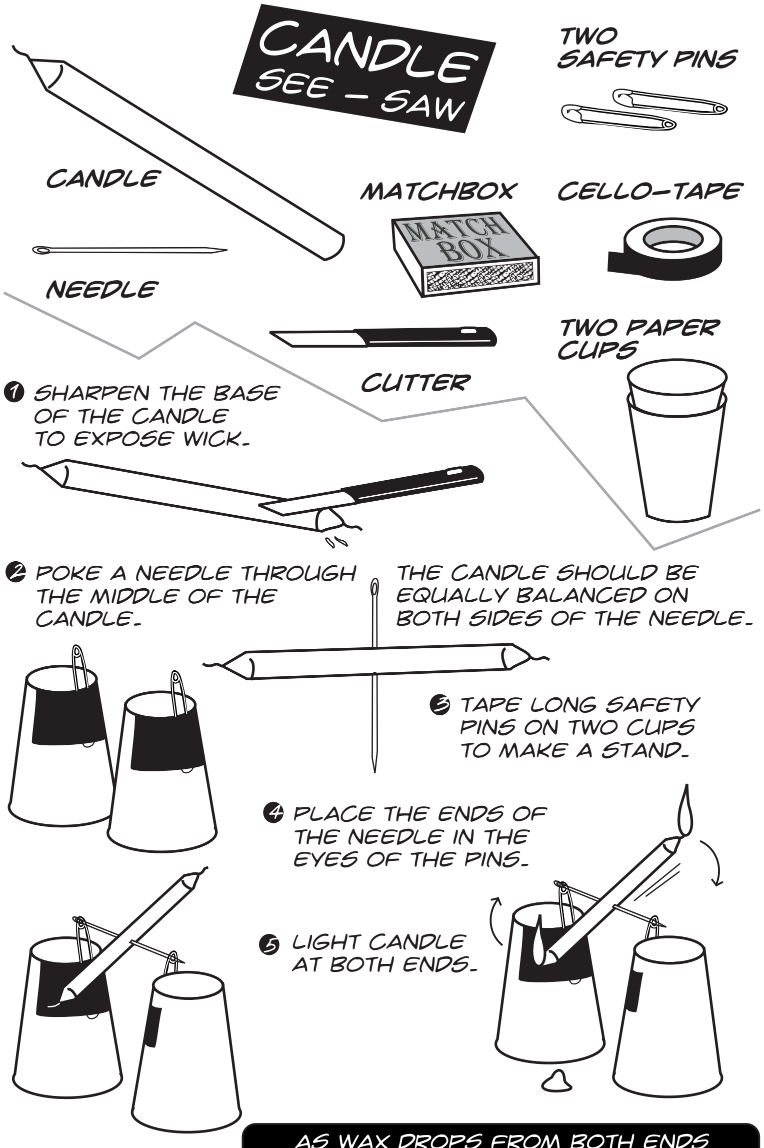


THE EGG WILL NOT BREAK BECAUSE IT FLOATS IN A FLUID WITH THE SAME DENSITY – LIKE A BABY IN A MOM'S BELLY.

❻ NOW DROP BOTTLE FROM A HEIGHT OF SIX FEET.

REPEAT THIS EXPERIMENT WITHOUT SALT AND THE EGG WILL BREAK!

CANDLE SEE – SAW



❶ SHARPEN THE BASE OF THE CANDLE TO EXPOSE WICK.

❷ POKE A NEEDLE THROUGH THE MIDDLE OF THE CANDLE.

THE CANDLE SHOULD BE EQUALLY BALANCED ON BOTH SIDES OF THE NEEDLE.

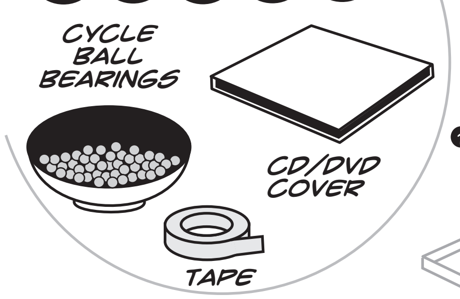
❸ TAPE LONG SAFETY PINS ON TWO CUPS TO MAKE A STAND.

❹ PLACE THE ENDS OF THE NEEDLE IN THE EYES OF THE PINS.

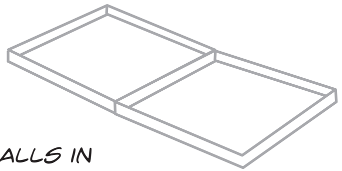
❺ LIGHT CANDLE AT BOTH ENDS.

AS WAX DROPS FROM BOTH ENDS OF THE CANDLE, ITS WEIGHT WILL SHIFT AND A SEE-SAW MOTION WILL SET IN.

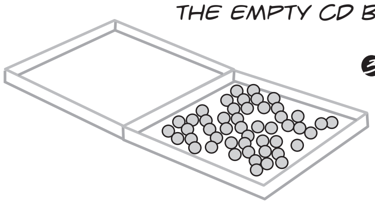
ATOMIC ARRAY



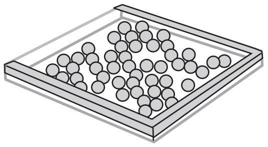
❶ OPEN THE CD COVER AND REMOVE THE CD HOLDER.

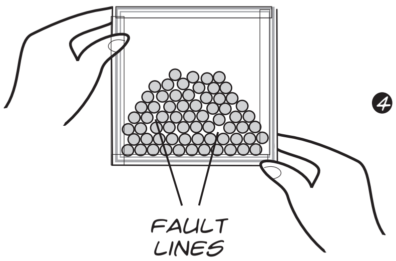


❷ PLACE LOTS OF BALLS IN THE EMPTY CD BOX.



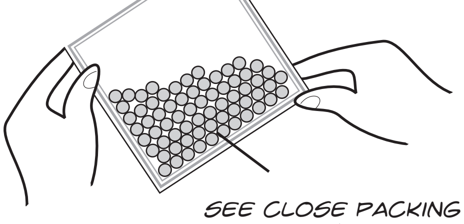
❸ SEAL JOINTS WITH TAPE. SHAKE THE BOX AND OBSERVE THE RANDOM BROWNIAN MOTION OF THE STEEL BALLS.





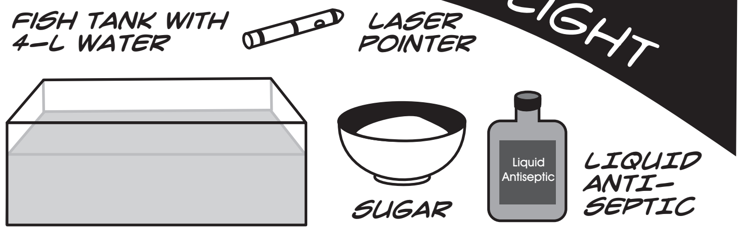
❹ SHAKE AND OBSERVE CLOSE PACKING AND FAULT LINES AS IN AN ATOMIC ARRAY.

MATTER IS COMPOSED OF ATOMS PACKED TOGETHER IN A LATTICE. AT PLACES THERE ARE GAPS AND FAULT LINES.



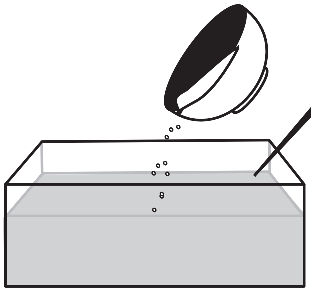
SEE CLOSE PACKING OF ATOMS!

ADD SUGAR BEND LIGHT



❶ ADD A FEW DROPS OF LIQUID ANTISEPTIC TO WATER. THE ANTISEPTIC HELPS IN ILLUMINATING THE PATH OF LIGHT.

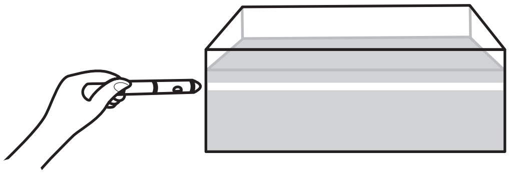
❷ ADD 500-G SUGAR TO WATER.



ATTENTION : DO NOT STIR AT ALL FOR 24 HOURS.

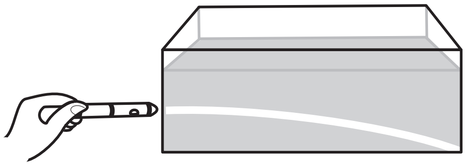
AFTER 24 HOURS, THE SUGAR WILL DISSOLVE IN WATER AND THE WATER WILL APPEAR CLEAR. HOWEVER, THE WATER WILL BE MORE DENSE AT THE BOTTOM AND LESS DENSE AT THE TOP. THERE WILL BE A DENSITY GRADIENT.

❸ ON SHINING LASER ON TOP, THE BEAM WILL GO STRAIGHT.

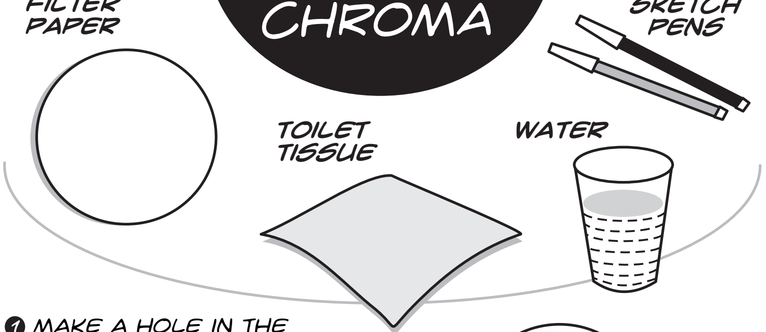


THE BEAM BENDS BECAUSE OF THE DENSITY GRADIENT IN THE SUGAR SOLUTION.

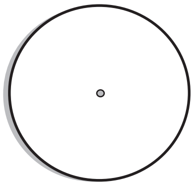
AS YOU GO LOWER DOWN, THE LASER BEAM WILL BEND.



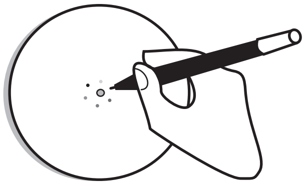
COLOURED CHROMA



1. MAKE A HOLE IN THE MIDDLE OF THE FILTER PAPER.

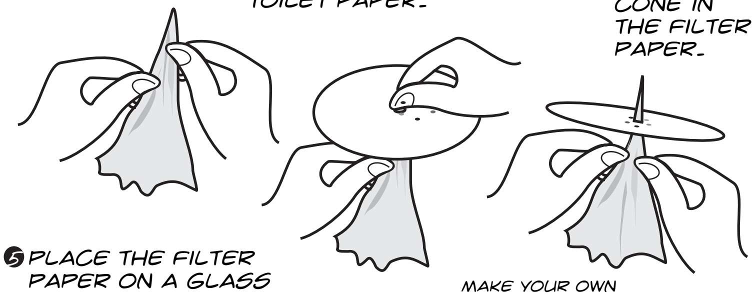


2. DRAW DIFFERENT COLOURED DOTS AROUND THE HOLE.

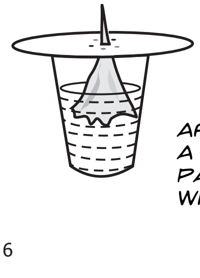


3. MAKE A CONICAL BEAK FROM THE TOILET PAPER.

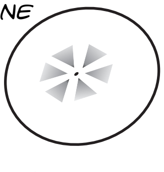
4. INSERT THE CONE IN THE FILTER PAPER.



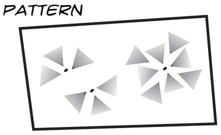
5. PLACE THE FILTER PAPER ON A GLASS FILLED WITH WATER. THE BASE OF THE CONE MUST DIP IN WATER.



AFTER A WHILE A BEAUTIFUL PATTERN WILL EMERGE.

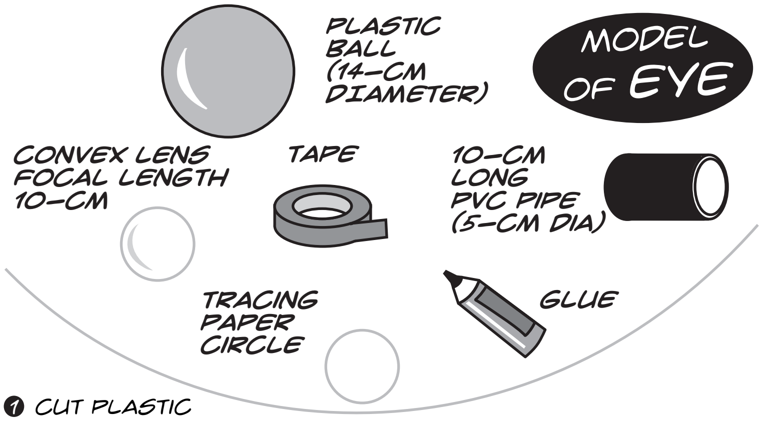


MAKE YOUR OWN PICTURE PATTERN CARDS.

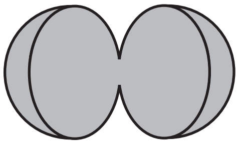


AS A RESULT OF CHROMATOGRAPHY VARIOUS COLOURS TRAVEL AT DIFFERENT SPEEDS, AND SEPARATE OUT.

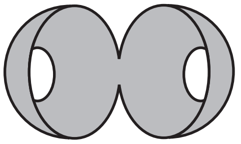
MODEL OF EYE


PLASTIC BALL (14-CM DIAMETER)
CONVEX LENS FOCAL LENGTH 10-CM
TAPE
10-CM LONG PVC PIPE (5-CM DIA)
TRACING PAPER CIRCLE
GLUE

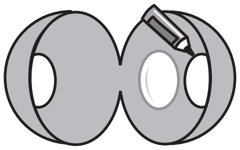
1. CUT PLASTIC BALL AS SHOWN.



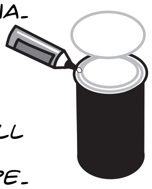
2. MAKE TWO OPPOSITE HOLES OF 5-CM DIAMETER.



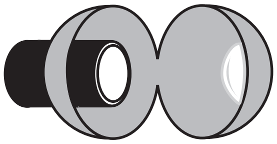
3. STICK A CONVEX LENS ON RIGHT HOLE FROM INSIDE.



4. GLUE TRACING PAPER ON ONE END OF PVC PIPE FOR RETINA.

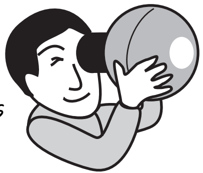


5. INSERT PVC PIPE IN THE LEFT HOLE WITH TRACING PAPER INSIDE.



6. CLOSE THE BALL AND SEAL ITS JOINT WITH TAPE.

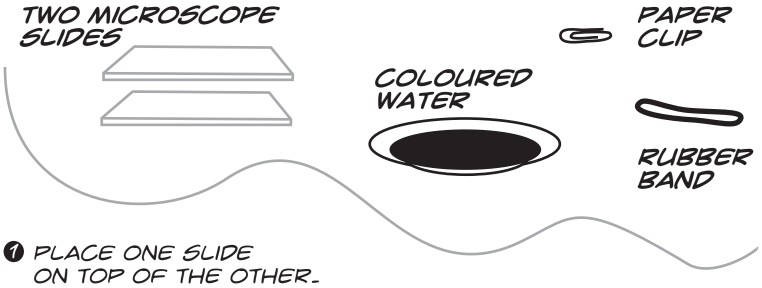
7. MOVE PIPE IN-OUT TO ADJUST THE DISTANCE BETWEEN LENS AND TRACING PAPER. SOON YOU WILL SEE A CLEAR IMAGE ON THE TRACING PAPER.



WHEN YOU LOOK THROUGH THE PVC PIPE, AN INVERTED IMAGE WILL APPEAR ON THE TRACING PAPER RETINA.

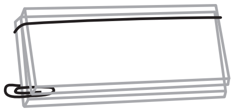
YOU WILL HAVE MADE A SIMPLE MODEL OF AN EYE!

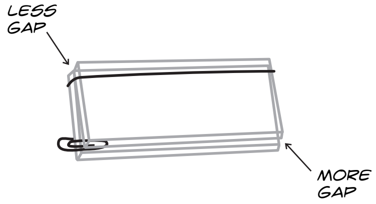
CAPILLARY ACTION



❶ PLACE ONE SLIDE ON TOP OF THE OTHER.

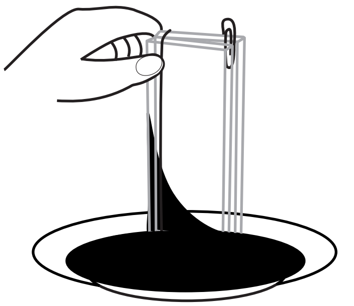
❷ INSERT A PAPER CLIP BETWEEN THE SLIDES AT ONE END. PLACE A RUBBER BAND ON THE OTHER END.

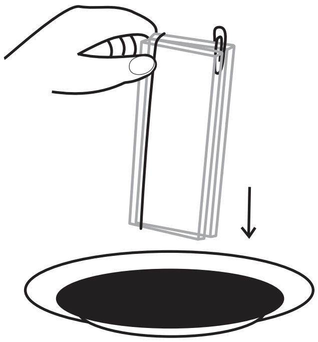




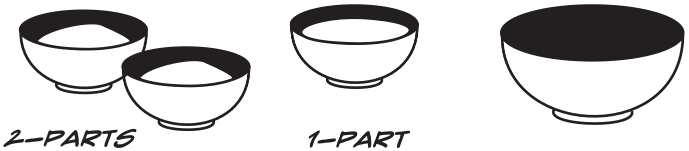
❸ PLACE THE SLIDES VERTICALLY IN COLOURED WATER.

BECAUSE OF SURFACE TENSION, THE COLOURED WATER WILL RISE IN A BEAUTIFUL PARABOLIC CURVE.





SOLID LIQUID



2-PARTS CORN FLOUR

1-PART WATER

BIG BOWL

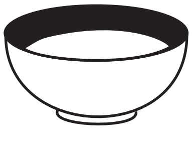
❶ MIX 2-PARTS OF CORN FLOUR WITH ONE PART OF WATER.

CORN FLOUR + WATER MAKES A VERY GOOD SLURRY.

❷ SLOWLY DIP YOUR FINGERS IN THE SLURRY. YOUR FINGERS WILL GO IN QUITE EASILY.

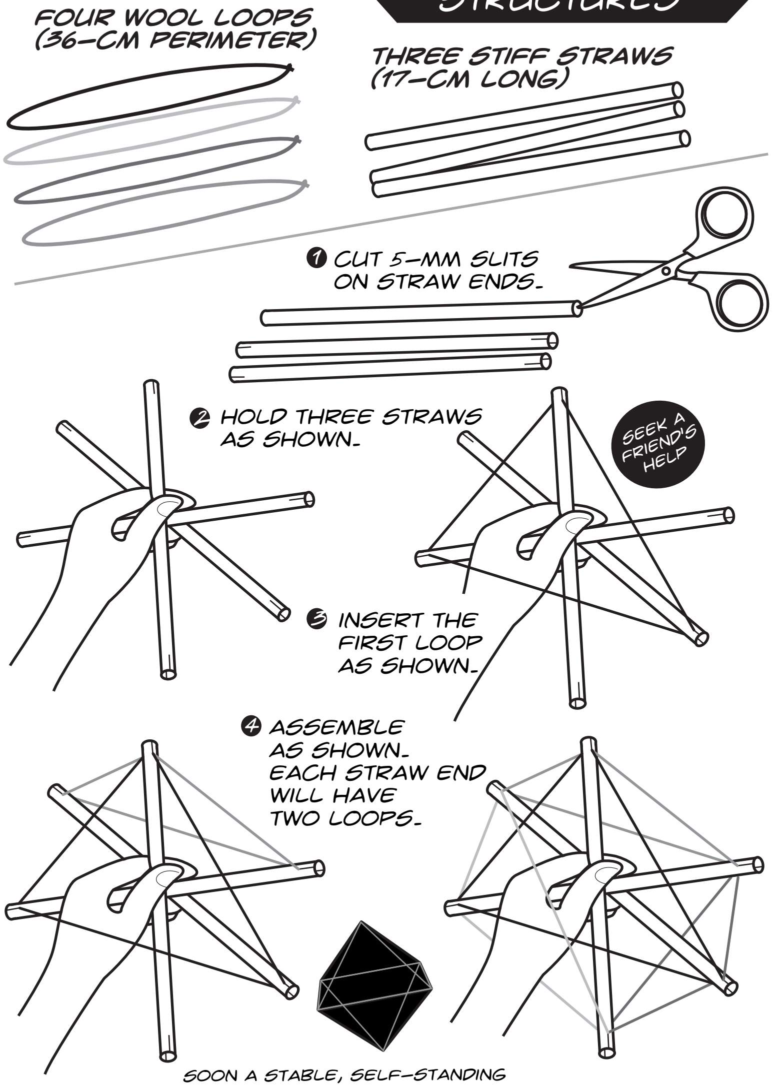
❸ NOW PUNCH HARD ON THE SURFACE OF THE SLURRY. YOU WILL ENCOUNTER A SOFT WALL. YOUR FIST WILL NOT GET WET.

CORN PARTICLES COME TOGETHER AS YOU PUNCH HARD. THIS MAKES THE SLURRY SOLID.



THE SURFACE OF THE SLURRY ACTS LIKE A SOFT WALL.

TENSEGRITY STRUCTURES



FOUR WOOL LOOPS (36-CM PERIMETER)
THREE STIFF STRAWS (17-CM LONG)
SEEK A FRIEND'S HELP

❶ CUT 5-MM SLITS ON STRAW ENDS.

❷ HOLD THREE STRAWS AS SHOWN.

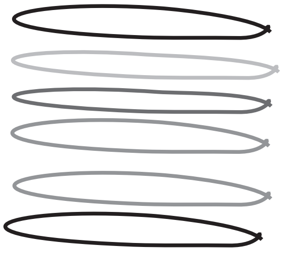
❸ INSERT THE FIRST LOOP AS SHOWN.

❹ ASSEMBLE AS SHOWN. EACH STRAW END WILL HAVE TWO LOOPS.

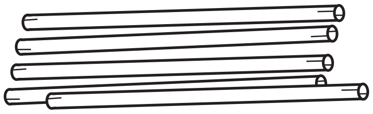
SOON A STABLE, SELF-STANDING OCTAHEDRON WILL EMERGE!

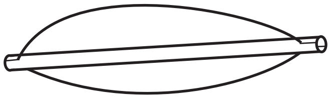
MAKE ANOTHER STRUCTURE!

SIX WOOL LOOPS
(35-CM PERIMETER)

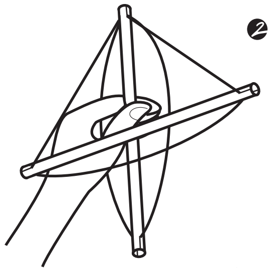


SIX STIFF STRAWS
(15-CM LONG) WITH
5-MM SLITS ON ENDS

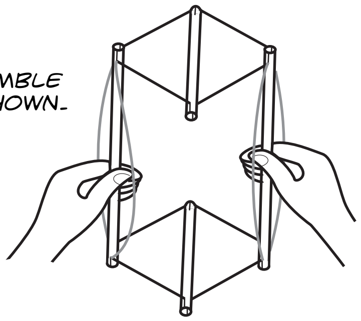




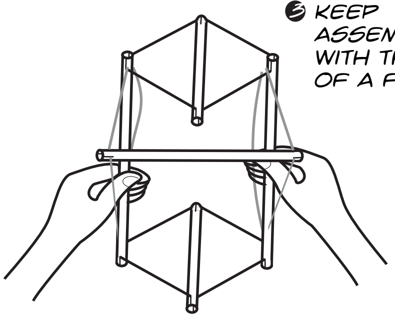
❶ INSERT WOOL LOOPS
IN THE NOTCHES OF
ALL SIX STIFF STRAWS
AS SHOWN.

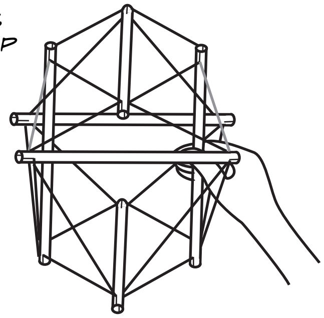


❷ ASSEMBLE
AS SHOWN.



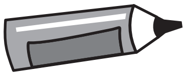
❸ KEEP
ASSEMBLING
WITH THE HELP
OF A FRIEND.



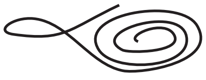


ALL THE STRAWS WILL BE UNDER COMPRESSION AND THE WOOL LOOPS WILL BE IN TENSION. SOON A STABLE AND ELEGANT STRUCTURE WILL EMERGE.

DOLL ON ROPE



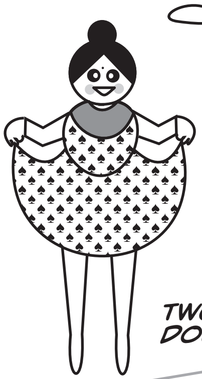
RUBBER GLUE



THREAD

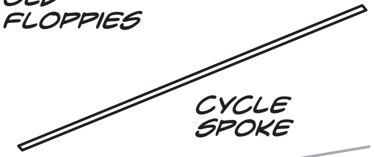
OLD FLOPPIES

STRAW PIECE



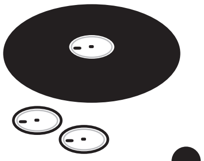
TWO CARD DOLLS

WEIGHTS OR MAGNETS

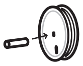


CYCLE SPOKE

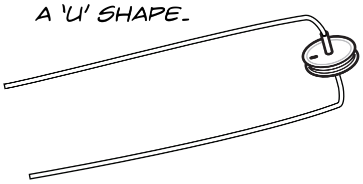
❶ OPEN AN OLD FLOPPY AND REMOVE ITS CIRCULAR FILM. ALSO REMOVE TWO METAL DISCS.



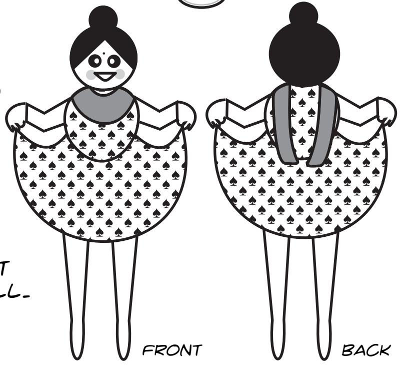
❷ STICK TWO DISCS BACK-TO-BACK TO MAKE A PULLEY. INSERT A STIFF STRAW OR REFILL AS BEARING.

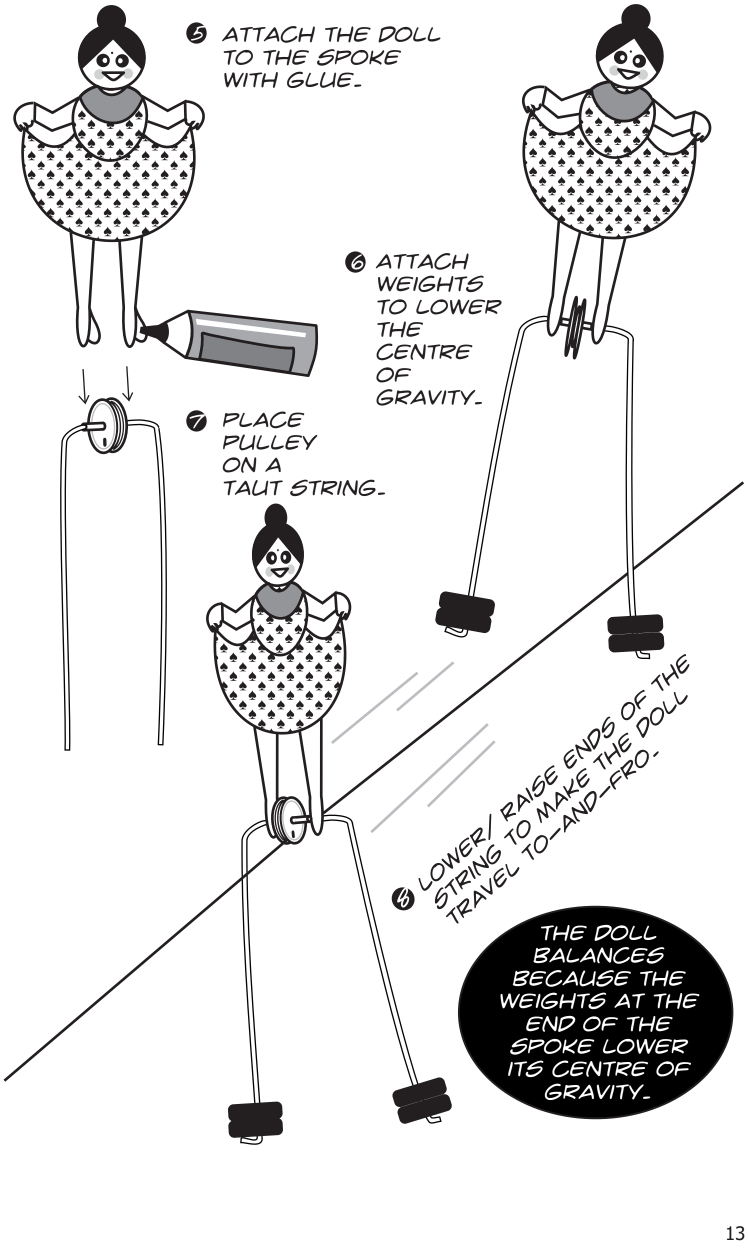


❸ INSERT PULLEY IN CYCLE SPOKE AND THEN BEND IT INTO A 'U' SHAPE.



❹ DRAW AND CUT THE FRONT AND BACK OF A CARD DOLL.





5. ATTACH THE DOLL TO THE SPOKE WITH GLUE.

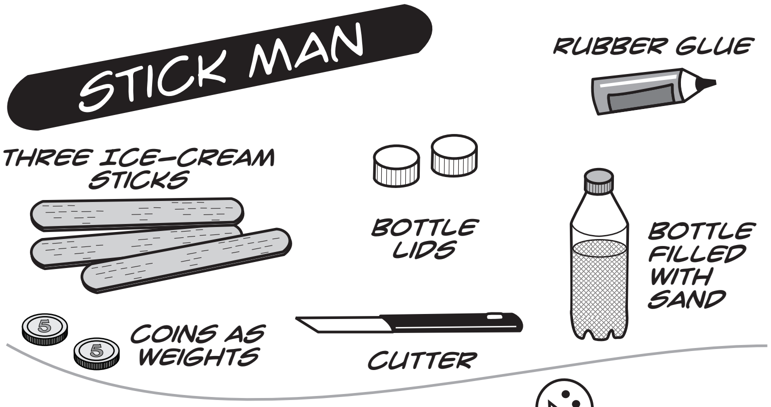
6. ATTACH WEIGHTS TO LOWER THE CENTRE OF GRAVITY.

7. PLACE PULLEY ON A TAUT STRING.

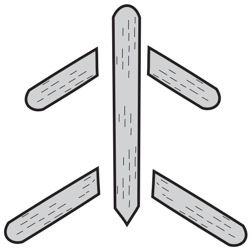
8. LOWER/ RAISE ENDS OF THE STRING TO MAKE THE DOLL TRAVEL TO-AND-FRO.

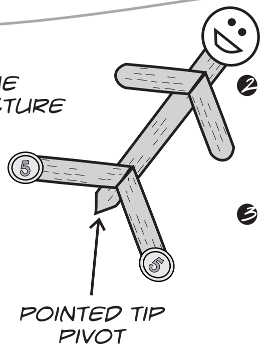
THE DOLL BALANCES BECAUSE THE WEIGHTS AT THE END OF THE SPOKE LOWER ITS CENTRE OF GRAVITY.

STICK MAN



❶ CUT ICE-CREAM STICKS WITH A CUTTER AND GLUE THEM TO MAKE A STRUCTURE AS SHOWN.

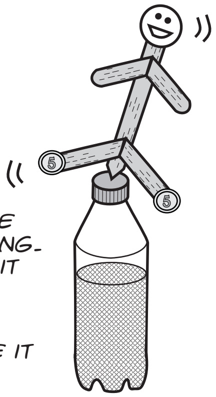




❷ STICK A BOTTLE CAP AS HEAD. THEN DRAW A FACE.

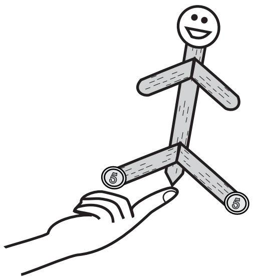
❸ STICK COINS ON FEET TO LOWER THE CENTRE OF GRAVITY.

❹ PLACE THE POINTED TIP OF THE STICK MAN ON THE LID OF A HEAVY BOTTLE FILLED WITH SAND.



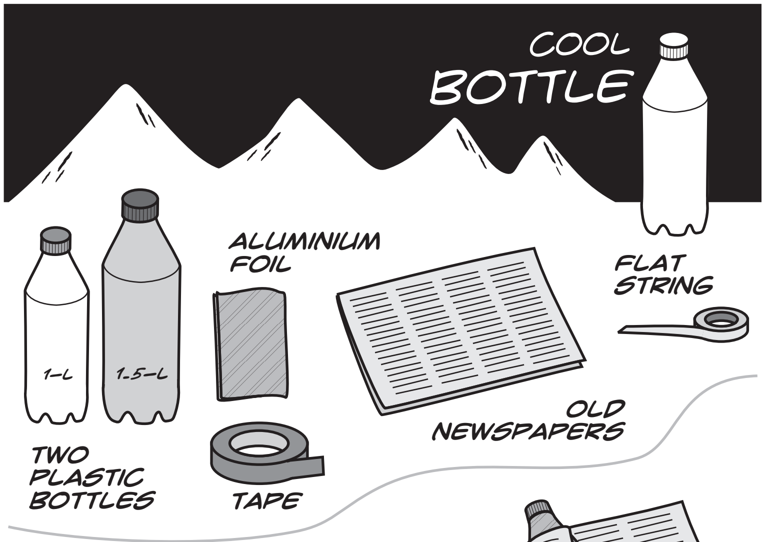
❺ THE TOY WILL BALANCE ITSELF WITHOUT FALLING. PUSH IT A LITTLE AND IT WILL ROCK AND SPIN AROUND.

YOU CAN ALSO BALANCE IT ON YOUR FINGER TIP.

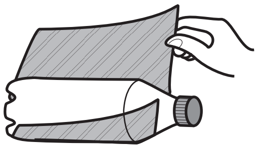


THE HEAVY COINS LOWER THE CENTRE OF GRAVITY AND THIS HELPS THE STICK MAN TO BALANCE.

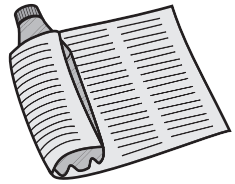
COOL BOTTLE



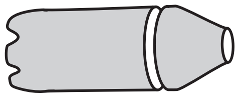
1. WRAP FOIL ON A 1-L BOTTLE.



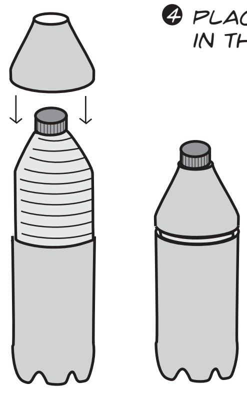
2. THEN WRAP IT IN SIX LAYERS OF NEWSPAPER FOR INSULATION.



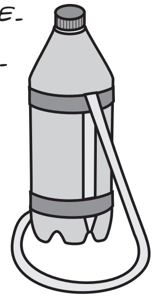
3. CUT A 1.5-L BOTTLE AS SHOWN.



4. PLACE 1-L BOTTLE IN THE BIG BOTTLE.

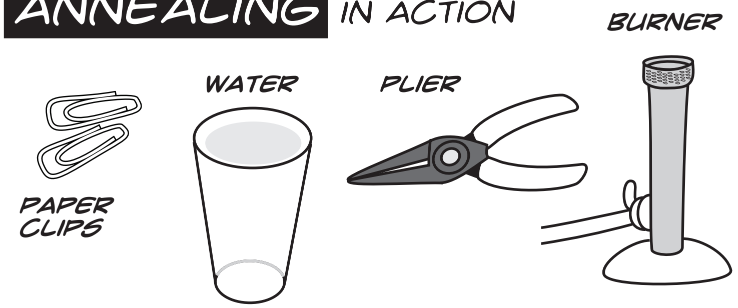


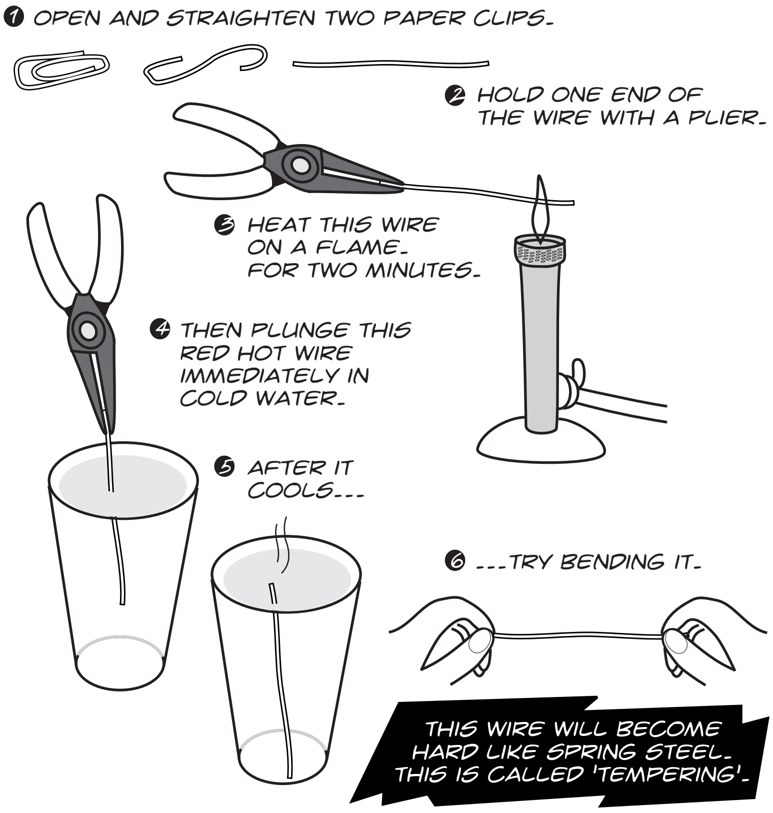
5. JOIN THE TWO HALVES OF THE BIG BOTTLE WITH TAPE. ATTACH A STRING TO COMPLETE THE THERMOS.



THE FOIL REFLECTOR AND NEWSPAPER INSULATION KEEPS THE WATER IN THE THERMOS COOL FOR A FEW HOURS.

ANNEALING IN ACTION





❶ OPEN AND STRAIGHTEN TWO PAPER CLIPS.

❷ HOLD ONE END OF THE WIRE WITH A PLIER.

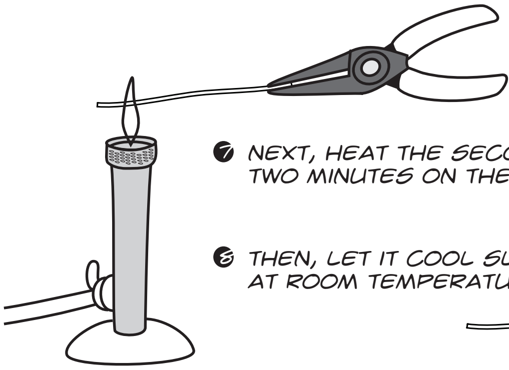
❸ HEAT THIS WIRE ON A FLAME. FOR TWO MINUTES.

❹ THEN PLUNGE THIS RED HOT WIRE IMMEDIATELY IN COLD WATER.

❺ AFTER IT COOLS...

❻ ...TRY BENDING IT.

THIS WIRE WILL BECOME HARD LIKE SPRING STEEL. THIS IS CALLED 'TEMPERING'.



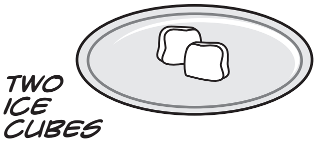
❼ NEXT, HEAT THE SECOND WIRE FOR TWO MINUTES ON THE FLAME.

❽ THEN, LET IT COOL SLOWLY AT ROOM TEMPERATURE.

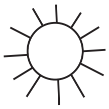
❾ BEND IT.

THIS WIRE WILL BECOME SOFT AND WILL BEND EASILY. THIS IS CALLED 'ANNEALING'.

MINI
SOLAR HEATER



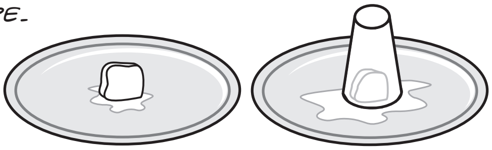
❶ PLACE TWO SIMILAR ICE CUBES ON TWO PLATES AND KEEP THEM IN THE SUN.



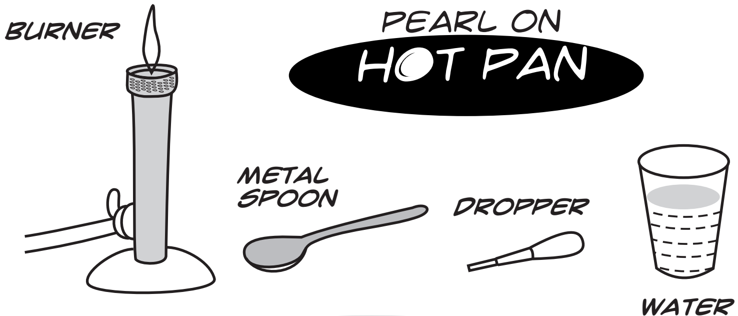
❷ COVER ONE CUBE WITH A TRANSPARENT GLASS.

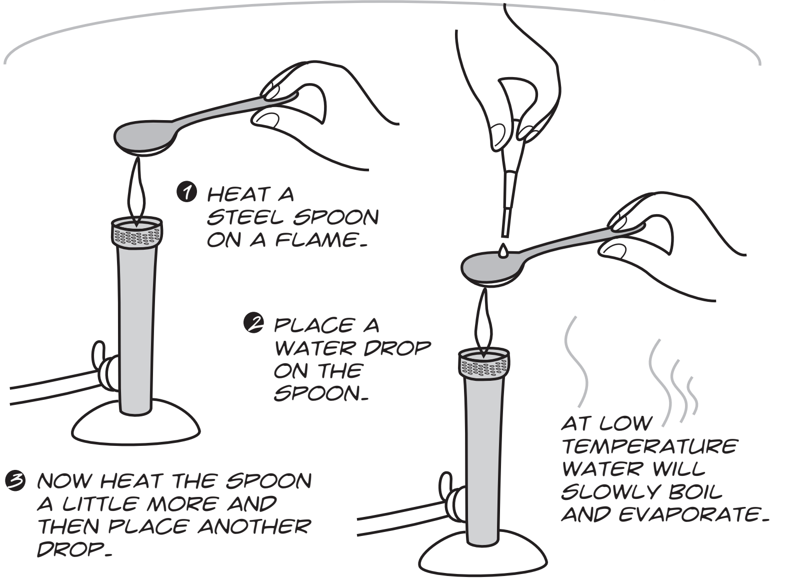
YOU WILL OBSERVE THAT THE COVERED CUBE WILL HAVE MELTED A LOT MORE.

THE GLASS ACTS LIKE A MINI SOLAR COOKER.



PEARL ON HOT PAN





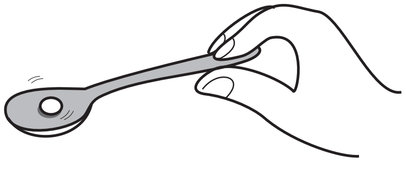
❶ HEAT A STEEL SPOON ON A FLAME.

❷ PLACE A WATER DROP ON THE SPOON.

❸ NOW HEAT THE SPOON A LITTLE MORE AND THEN PLACE ANOTHER DROP.

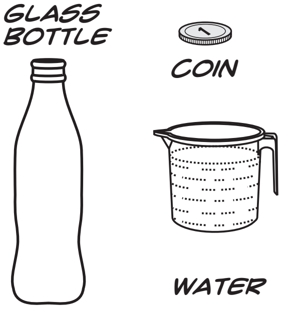
AT LOW TEMPERATURE WATER WILL SLOWLY BOIL AND EVAPORATE.

AT HIGH TEMPERATURE THE DROP WILL FLOAT ON THE SPOON LIKE A PEARL!

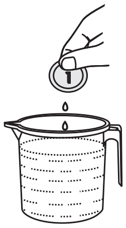


AS SOON AS THE DROP IS PLACED ON THE HOT SPOON, PART OF IT TURNS INTO VAPOUR. THIS FORMS AN INSULATING LAYER AND ENABLES THE DROP TO FLOAT LIKE A BEAD!

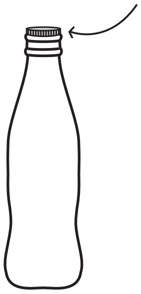
EXPANSION OF AIR



① WET A COIN...

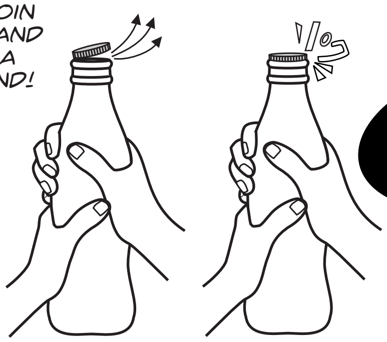


② ...AND PLACE IT ON THE MOUTH OF A GLASS BOTTLE.



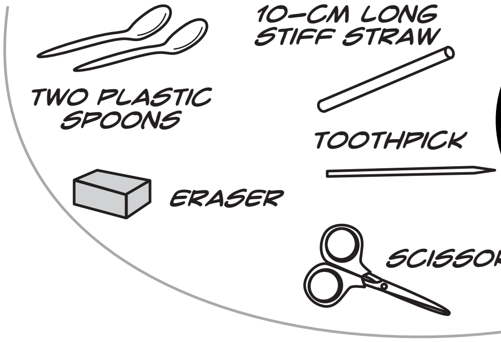
③ RUB YOUR PALMS TO WARM THEM AND PRESS THEM ON THE BOTTLE.

④ AFTER A WHILE THE AIR INSIDE WILL EXPAND AND THE COIN WILL RISE AND FALL WITH A PUCK SOUND!

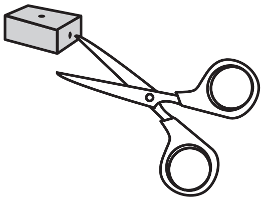


THIS SIMPLE EXPERIMENT SHOWS THAT AIR EXPANDS ON HEATING!

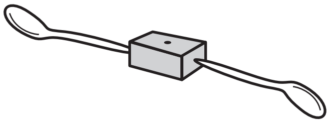
SPOON PROPELLER



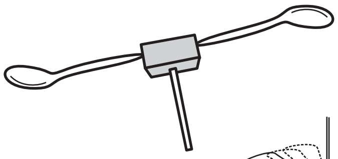
1. MAKE HOLES IN AN ERASER.



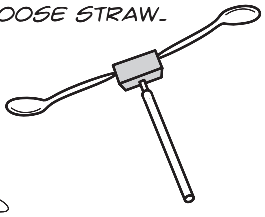
2. INSERT SPOONS IN THE RUBBER. THEY SHOULD BE INCLINED IN OPPOSITE DIRECTIONS.



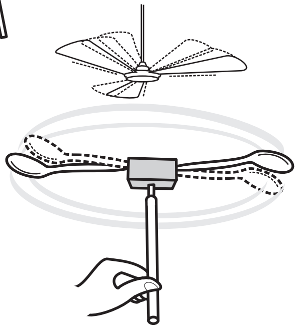
3. INSERT A TOOTHPICK IN THE RUBBER AS SHOWN.



4. PLACE THE TOOTHPICK IN A STIFF AND LOOSE STRAW.

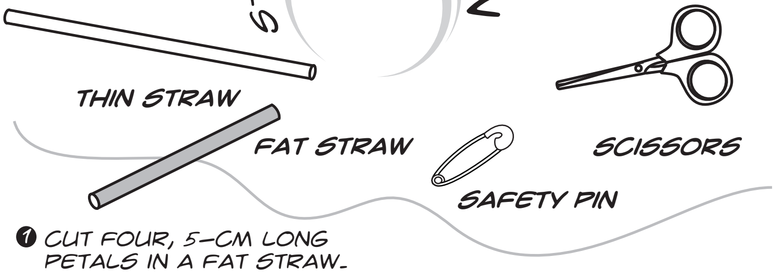


5. PLACE UNDER A CEILING FAN TO MAKE THE SPOON PROPELLER SPIN!

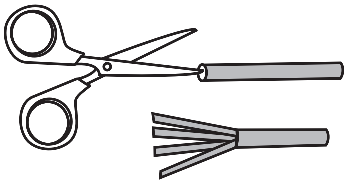


AIR FROM THE CEILING FAN STRIKES THE SPOONS AT AN ANGLE AND MAKES THEM SPIN.

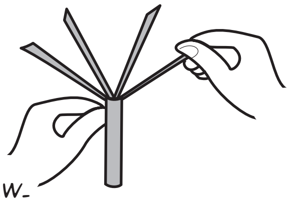
STRAW PETAL FAN



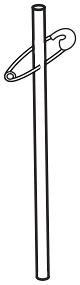
❶ CUT FOUR, 5-CM LONG PETALS IN A FAT STRAW.



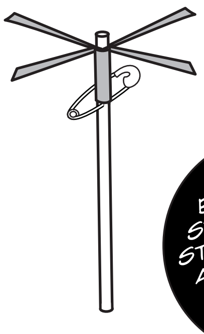
❷ TWIST THE PETALS TO MAKE FAN BLADES.



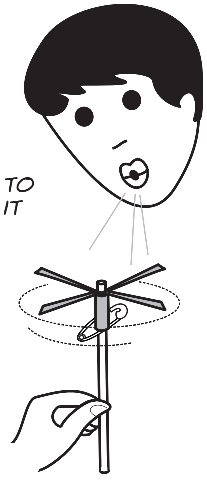
❸ FIX A SAFETY PIN IN A THIN STRAW. THE PIN WILL PREVENT THE FAN FROM FALLING.



❹ PLACE THE STRAW PETAL FAN IN THE THIN STRAW.

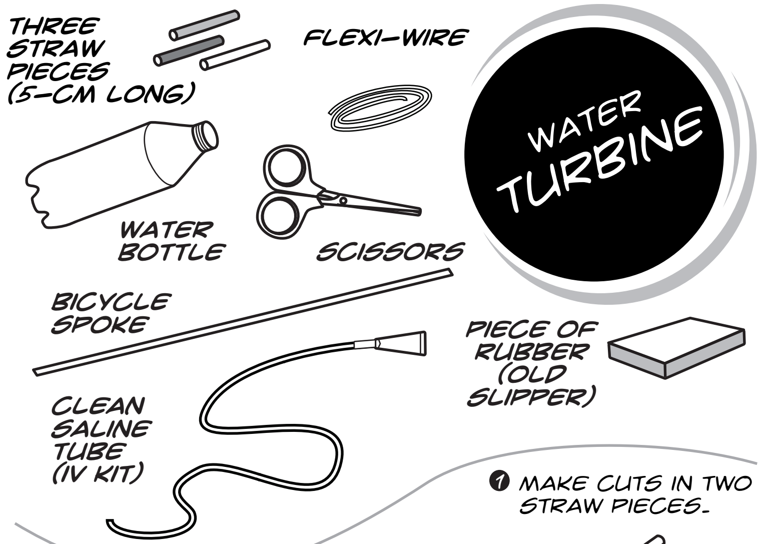


❺ BLOW TO MAKE IT SPIN.

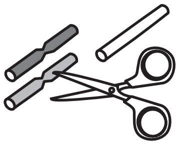


AS YOU BLOW, AIR STRIKES THE STRAW PETALS AT AN ANGLE AND MAKES THE FAN SPIN.

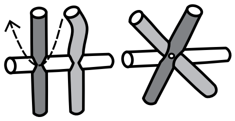
WATER TURBINE


THREE STRAW PIECES (5-CM LONG)
FLEXI-WIRE
WATER BOTTLE
SCISSORS
BICYCLE SPOKE
PIECE OF RUBBER (OLD SLIPPER)
CLEAN SALINE TUBE (IV KIT)

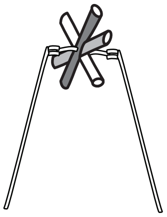
❶ MAKE CUTS IN TWO STRAW PIECES.



● ASSEMBLE A TURBINE AS SHOWN. MAKE A HOLE IN THE CENTRE. INSERT A WIRE AXLE. MAKE LOOPS ON BOTH ENDS OF WIRE. THE LOOPS ACT AS STOPPERS.

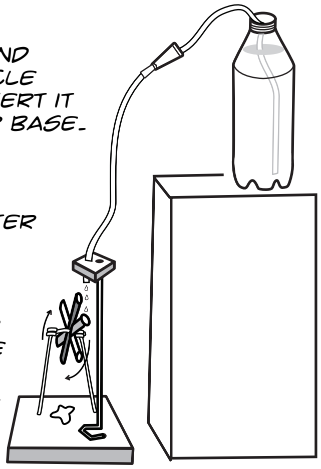


❸ MAKE A STAND USING A CYCLE SPOKE. INSERT IT IN A RUBBER BASE.



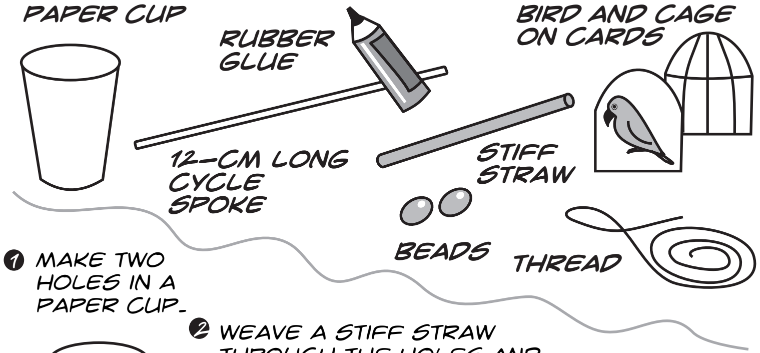
❹ DIP ONE END OF SALINE TUBE IN A WATER BOTTLE KEPT HIGH UP.

❺ FIX THE OTHER END OF SALINE TUBE IN THE RUBBER HOLE.

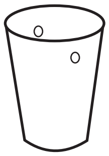


THE DRIPPING WATER FROM THE SALINE TUBE WILL ROTATE THE TURBINE!

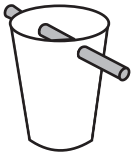
ANIMATION ON FLYWHEEL



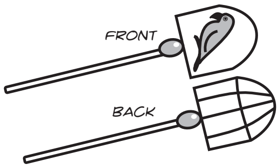
❶ MAKE TWO HOLES IN A PAPER CUP.



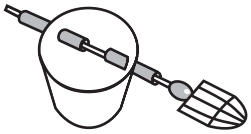
❷ WEAVE A STIFF STRAW THROUGH THE HOLES AND FIX IT WITH RUBBER GLUE.



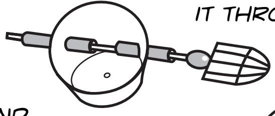
❸ STICK PARROT AND CAGE BACK-TO-BACK ON A CYCLE SPOKE. WEAVE A BEAD IN THE SPOKE.



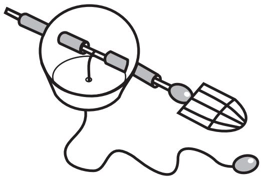
❹ CUT MIDDLE PART OF STRAW AND WEAVE SPOKE IN IT.

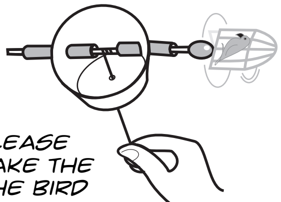


❺ MAKE A HOLE IN THE BASE. TIE THREAD TO SPOKE AND WEAVE IT THROUGH THE HOLE.



❻ TIE BEAD ON OTHER END OF THREAD. WIND THREAD ON THE SPOKE.

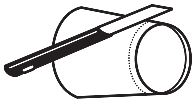




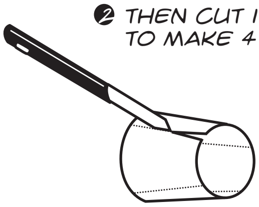
❼ PULL AND RELEASE THREAD TO MAKE THE CARD SPIN. THE BIRD WILL APPEAR TO BE INSIDE THE CAGE.

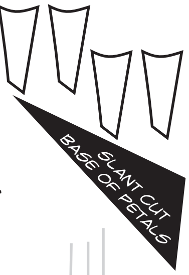
CUP
HELICOPTER

1. REMOVE THE BASE OF ONE CUP.

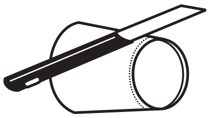


2. THEN CUT IT IN QUARTERS TO MAKE 4 SIMILAR PETALS.

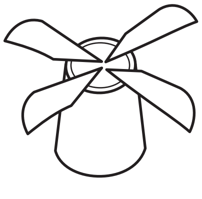



SLANT CUT BASE OF PETALS

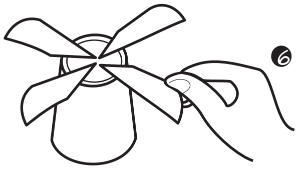
3. CUT RIM OF OTHER CUP. ITS BASE SHOULD BE FLAT.

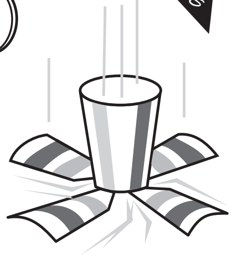


4. STICK DOUBLE TAPE ON ITS BASE AND FIX FOUR PETALS.



5. TWIST PETALS TO MAKE BLADES.

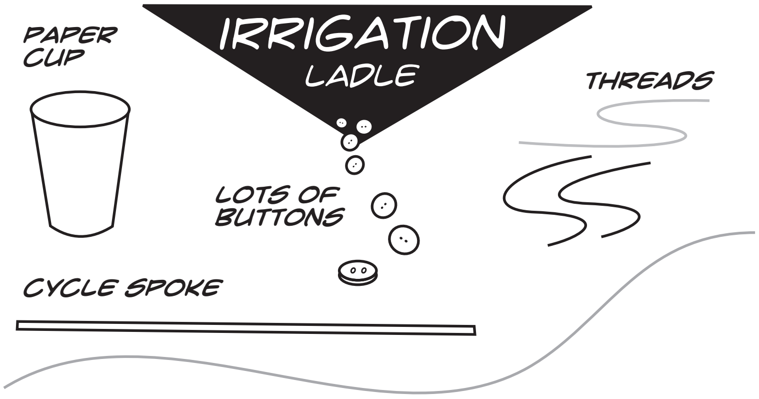


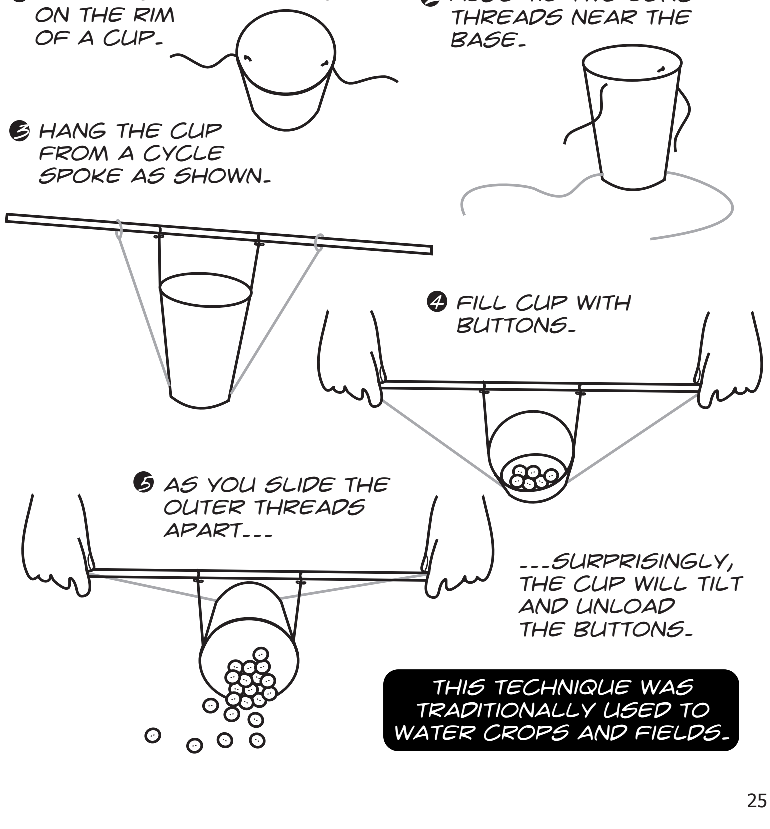


6. DECORATE AND DROP THE CUP FROM A HEIGHT. THE CUP HELICOPTER WILL COME DOWN SPINNING.

THE CURVED BLADES OF THE FALLING HELICOPTER MAKE IT SPIN.

IRRIGATION
LADLE





❶ TIE TWO SHORT THREADS ON THE RIM OF A CUP.

❷ ALSO TIE TWO LONG THREADS NEAR THE BASE.

❸ HANG THE CUP FROM A CYCLE SPOKE AS SHOWN.

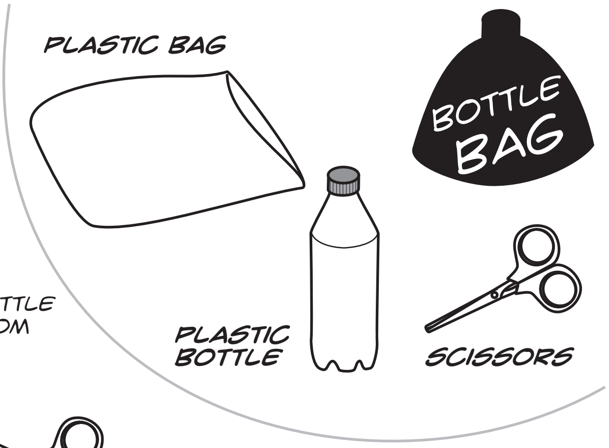
❹ FILL CUP WITH BUTTONS.

❺ AS YOU SLIDE THE OUTER THREADS APART...

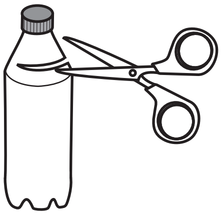
...SURPRISINGLY, THE CUP WILL TILT AND UNLOAD THE BUTTONS.

THIS TECHNIQUE WAS TRADITIONALLY USED TO WATER CROPS AND FIELDS.

BOTTLE BAG

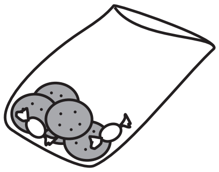


1. CUT A BOTTLE 5-CM FROM THE TOP.

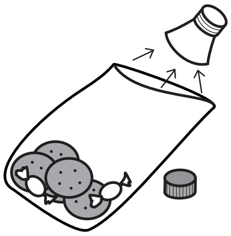


YOU WILL NEED ONLY THE TOP PART WITH THE LID.

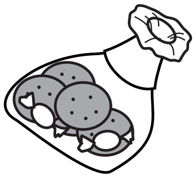
2. FILL A THIN PLASTIC BAG WITH GOODIES.



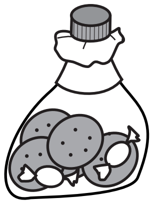
3. WEAVE THE BAG MOUTH THROUGH THE BOTTLE.



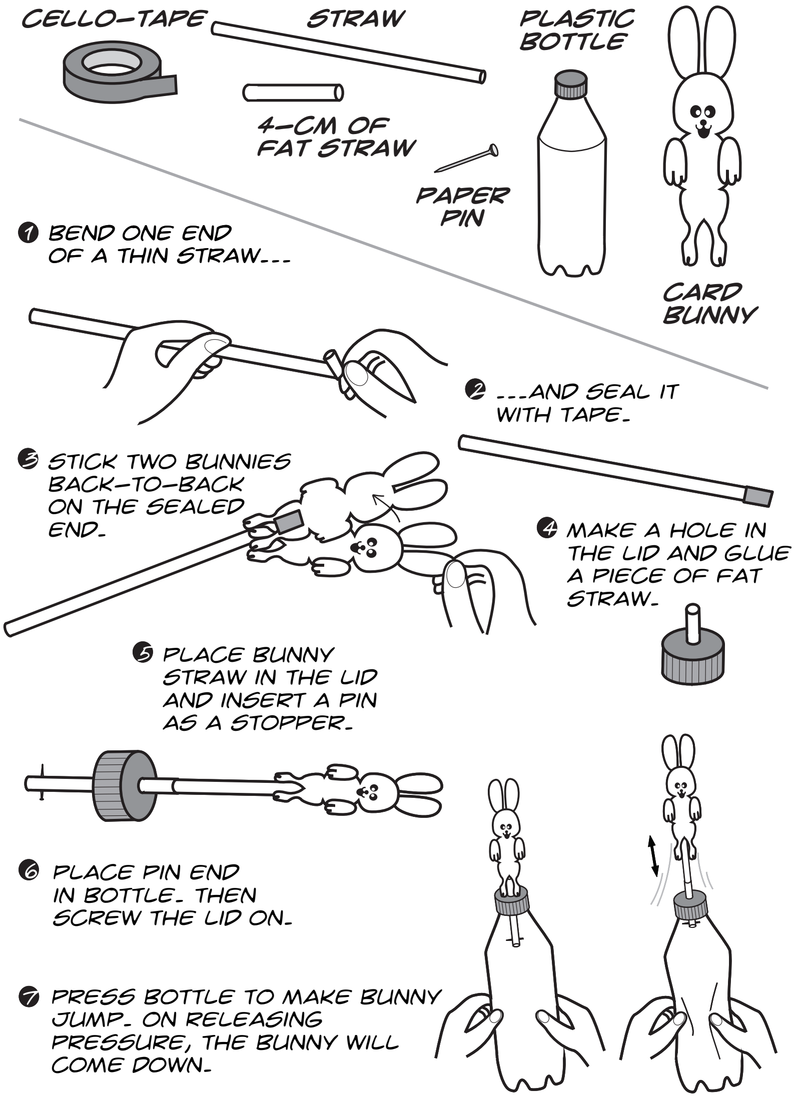
4. FLARE THE MOUTH OF THE BAG.



5. SCREW ON THE LID TO SEAL THE BAG. OPEN WHEN YOU WANT A TREAT!



UP DOWN BUNNY



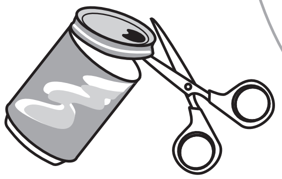
1. BEND ONE END OF A THIN STRAW...
2. ...AND SEAL IT WITH TAPE.
3. STICK TWO BUNNIES BACK-TO-BACK ON THE SEALED END.
4. MAKE A HOLE IN THE LID AND GLUE A PIECE OF FAT STRAW.
5. PLACE BUNNY STRAW IN THE LID AND INSERT A PIN AS A STOPPER.
6. PLACE PIN END IN BOTTLE. THEN SCREW THE LID ON.
7. PRESS BOTTLE TO MAKE BUNNY JUMP. ON RELEASING PRESSURE, THE BUNNY WILL COME DOWN.

ALUMINIUM CAN BOWL

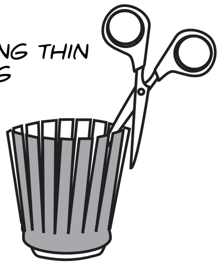
ALUMINIUM CAN

SCISSORS

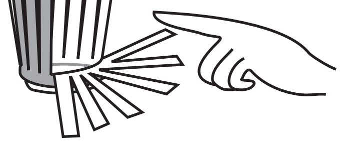
❶ CUT THE TOP OF A CAN.

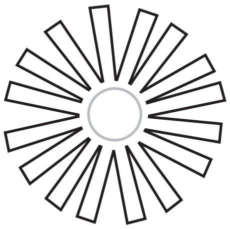


❷ THEN CUT LONG THIN STRIPS ALONG ITS HEIGHT.



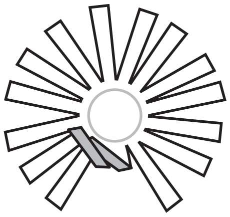
❸ BEND ALL THE PETALS OUTWARDS AS SHOWN.



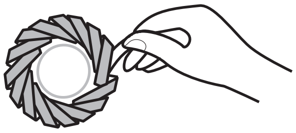


THE PETALS WILL LOOK LIKE THE SUN'S RAYS.

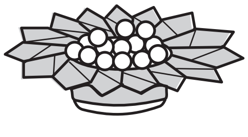
❹ FOLD EACH PETAL TO TOUCH THE CAN'S RIM.



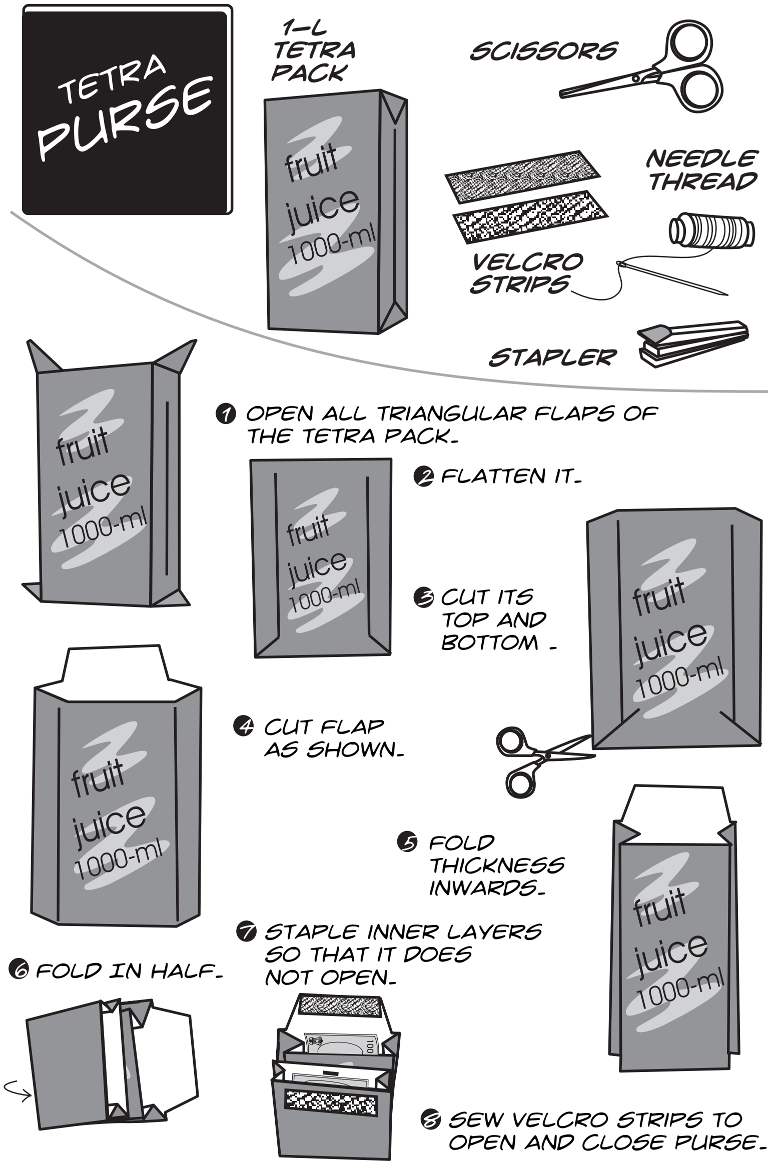
❺ KEEP FOLDING AND TUCK IN THE LAST STRIP TO MAKE A BEAUTIFUL BOWL.



KEEP SMALL TRINKETS IN THIS BOWL!

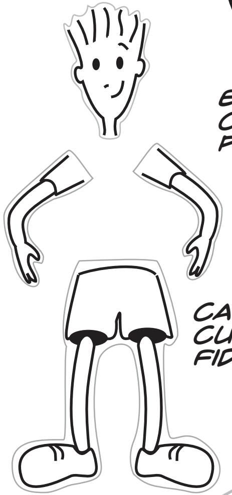


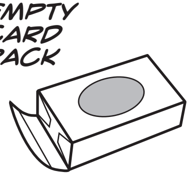
TETRA PURSE

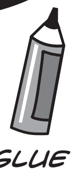


1. OPEN ALL TRIANGULAR FLAPS OF THE TETRA PACK.
2. FLATTEN IT.
3. CUT ITS TOP AND BOTTOM .
4. CUT FLAP AS SHOWN.
5. FOLD THICKNESS INWARDS.
6. FOLD IN HALF.
7. STAPLE INNER LAYERS SO THAT IT DOES NOT OPEN.
8. SEW VELCRO STRIPS TO OPEN AND CLOSE PURSE.

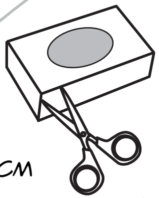
FIDO-DIDO
CLOWN


CARD SHEET CUT OUTS OF FIDO-DIDO

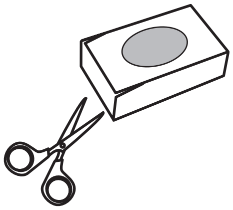




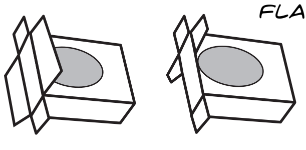
❶ CUT TOP AND BOTTOM FLAPS FROM A CARD PACK.



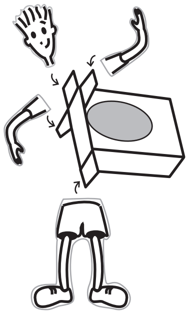
❷ CUT 1.5-CM ALONG FOUR CORNERS.



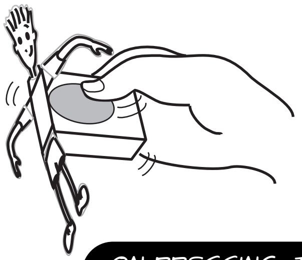
❸ OPEN ALL FOUR FLAPS. CUT AND SHORTEN LONG FLAPS AS SHOWN.



❹ APPLY GLUE AND STICK CUT OUTS OF HEAD, HANDS AND LEGS ON FLAPS.

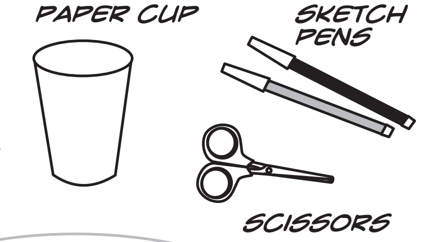


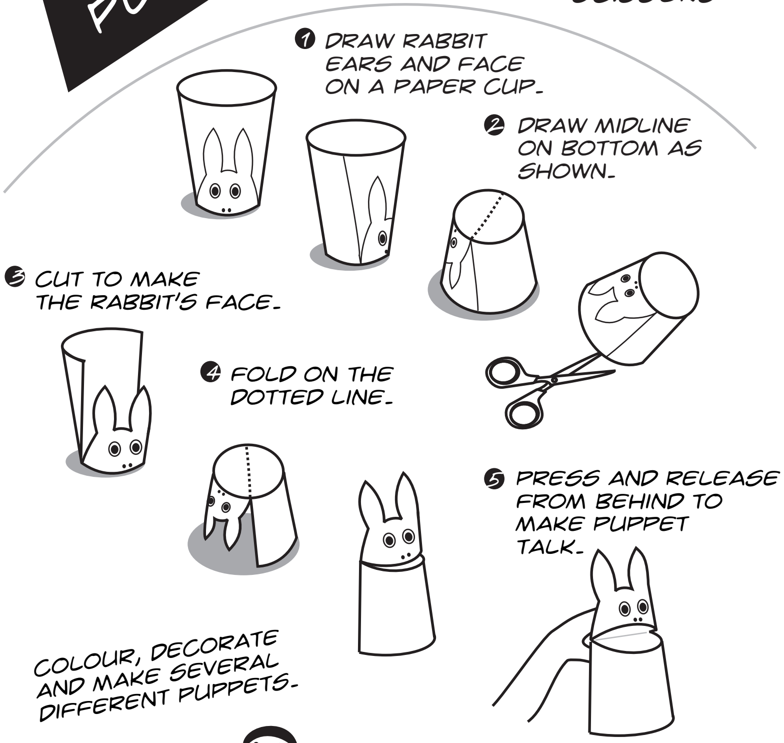
❺ PRESS AND MOVE THE BOX TO MAKE FIDO-DIDO DANCE.



ON PRESSING, THE RECTANGULAR BOX BECOMES A PARALLELOGRAM. THIS MAKES FIDO-DIDO DANCE.

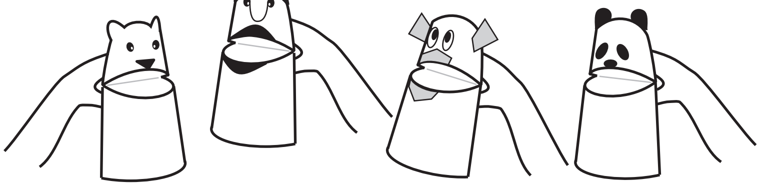
PAPER CUP PUPPET



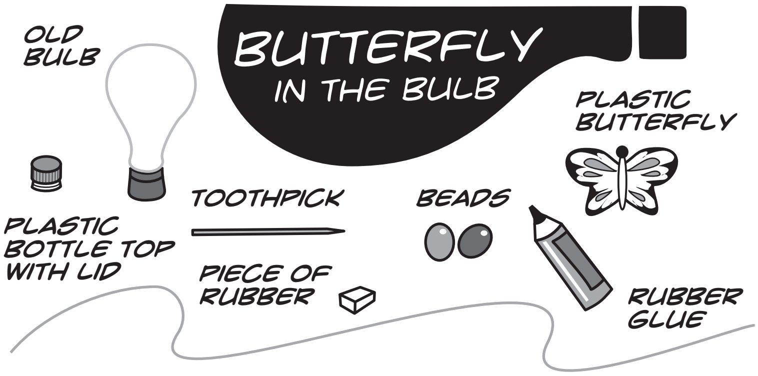


1. DRAW RABBIT EARS AND FACE ON A PAPER CUP.
2. DRAW MIDLINE ON BOTTOM AS SHOWN.
3. CUT TO MAKE THE RABBIT'S FACE.
4. FOLD ON THE DOTTED LINE.
5. PRESS AND RELEASE FROM BEHIND TO MAKE PUPPET TALK.

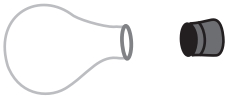
COLOUR, DECORATE AND MAKE SEVERAL DIFFERENT PUPPETS.



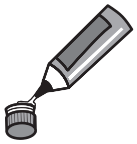
BUTTERFLY IN THE BULB



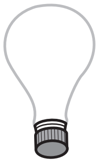
❶ REMOVE THE BASE OF A FUSED BULB WITH AN ADULT'S HELP.



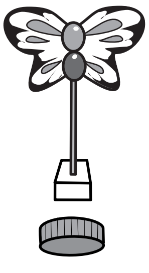
❷ APPLY RUBBER GLUE ON PLASTIC BOTTLE TOP.



❸ STICK BOTTLE TOP TO THE BULB MOUTH.

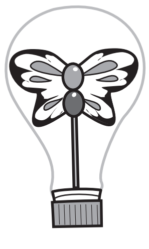


❹ MAKE BUTTERFLY ASSEMBLY AS SHOWN. FIX IT INSIDE THE LID WITH GLUE.

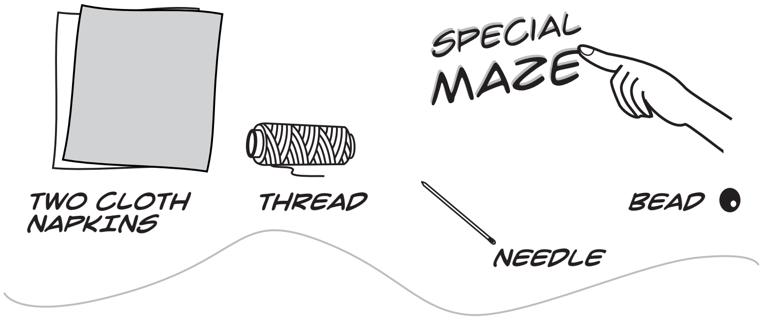


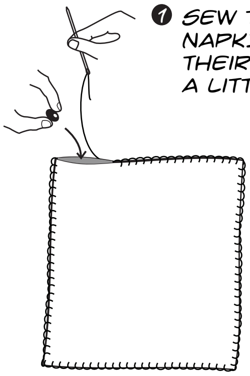
❺ FOLD THE WINGS AND PLACE THE BUTTERFLY IN THE BULB. SCREW THE CAP.

YOUR 'BUTTERFLY IN THE BULB' IS READY!



SPECIAL MAZE

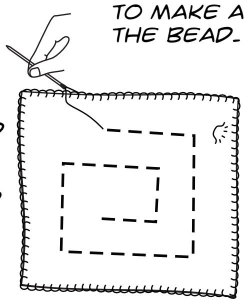




❶ SEW TWO SIMILAR NAPKINS ALONG THEIR EDGES LEAVING A LITTLE OPENING.

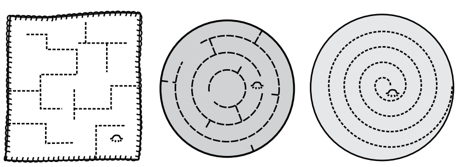
❷ SLIP A BEAD IN THIS OPENING AND SEW COMPLETELY.

❸ HEM DIFFERENT PATTERNS ON THE TWO NAPKINS TO MAKE A MAZE FOR THE BEAD.



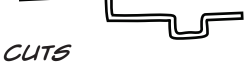
❹ BLINDFOLD A FRIEND AND ASK YOUR FRIEND TO NEGOTIATE THE BEAD THROUGH THE MAZE.

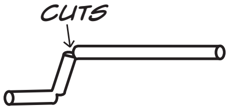
THIS IS AN EXCELLENT PUZZLE FOR THE VISUALLY CHALLENGED!


MAKE DIFFERENT MAZE PATTERNS.

CRANKY CRANK

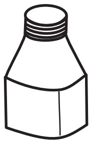
CARD DOLL


STIFF WIRE CRANK

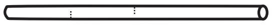


STIFF STRAW PISTON

LID WITH STRAW PIECE

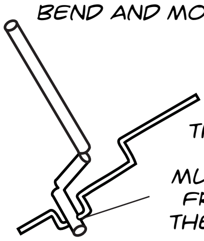

CUT BOTTLE

SCISSORS

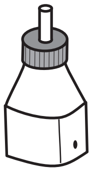


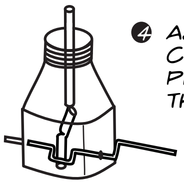
1. MAKE TWO CUTS ON OPPOSITE ENDS OF A STIFF STRAW.

2. ASSEMBLE WIRE CRANK WITH PISTON. BECAUSE OF THE TWO CUTS THE MOVING PISTON WILL BEND AND MOVE FREELY.


THE WIRE CRANK MUST MOVE FREELY IN THE PISTON.

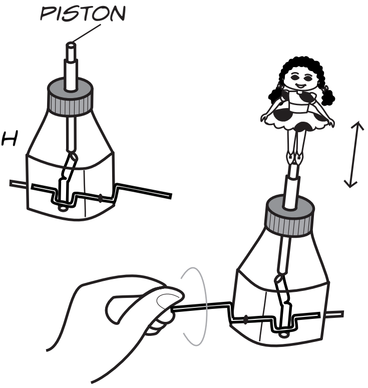
3. MAKE TWO HOLES ON THE BOTTLE AT OPPOSITE ENDS.

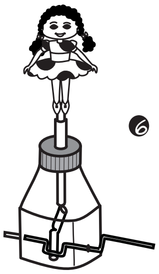




4. ASSEMBLE CRANK, PISTON IN THE BOTTLE.

5. INSERT PISTON THROUGH THE LID STRAW.

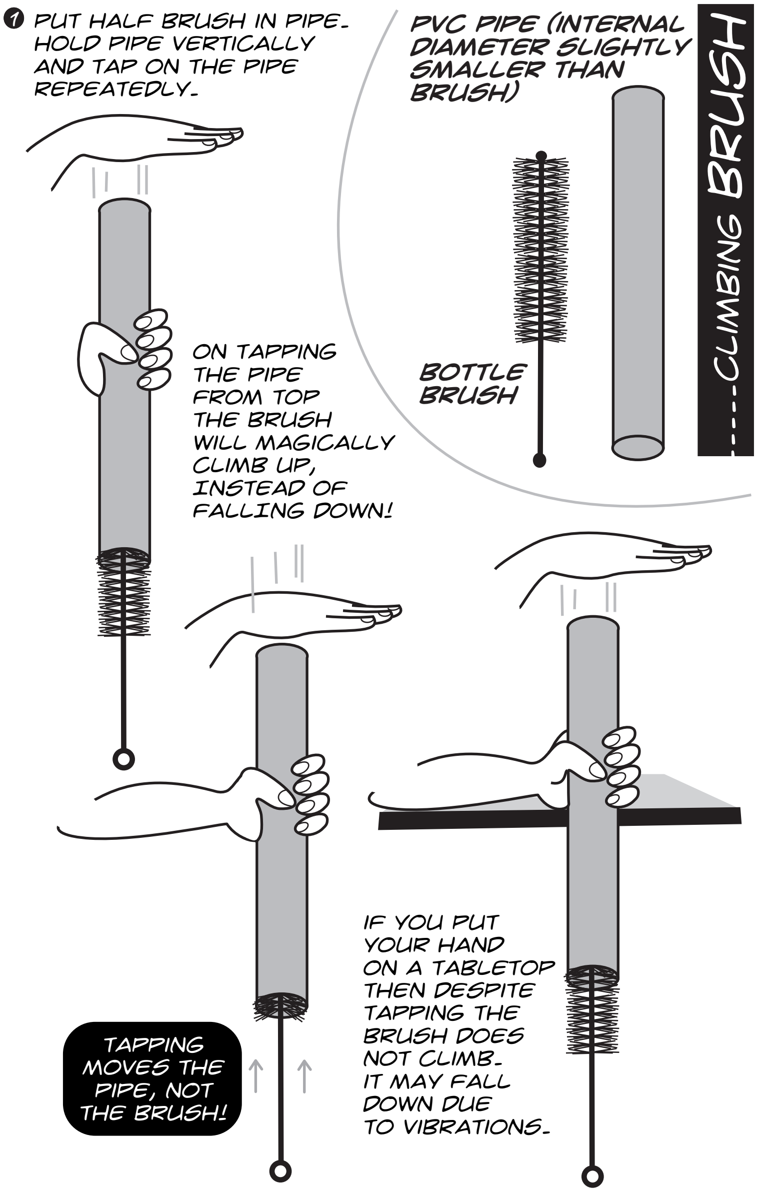




6. GLUE THE DOLL TO THE PISTON STRAW.

7. ON ROTATING, THE CRANK DOLL WILL MOVE UP AND DOWN.

....CLIMBING BRUSH


PVC PIPE (INTERNAL DIAMETER SLIGHTLY SMALLER THAN BRUSH)
BOTTLE BRUSH

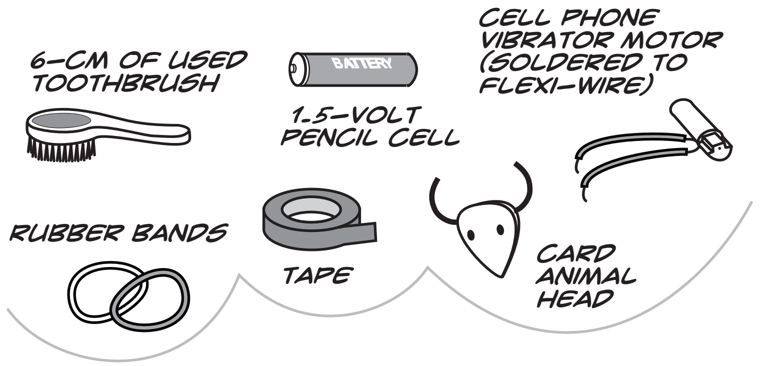
❶ PUT HALF BRUSH IN PIPE. HOLD PIPE VERTICALLY AND TAP ON THE PIPE REPEATEDLY.

ON TAPPING THE PIPE FROM TOP THE BRUSH WILL MAGICALLY CLIMB UP, INSTEAD OF FALLING DOWN!

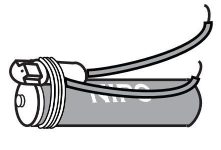
TAPPING MOVES THE PIPE, NOT THE BRUSH!

IF YOU PUT YOUR HAND ON A TABLETOP THEN DESPITE TAPPING THE BRUSH DOES NOT CLIMB. IT MAY FALL DOWN DUE TO VIBRATIONS.

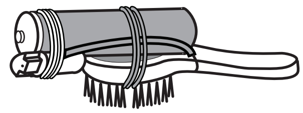
BRUSH IN RUSH



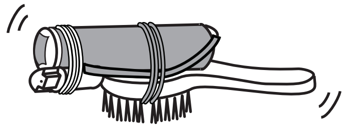
❶ AFFIX VIBRATOR MOTOR TIGHTLY TO BATTERY WITH A RUBBER BAND.



❷ FIX MOTOR-VIBRATOR ASSEMBLY ON THE TOOTHBRUSH WITH A RUBBER BAND.

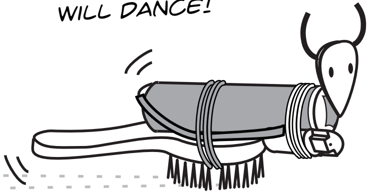


❸ TAPE WIRE ENDS TO BATTERY TERMINALS.



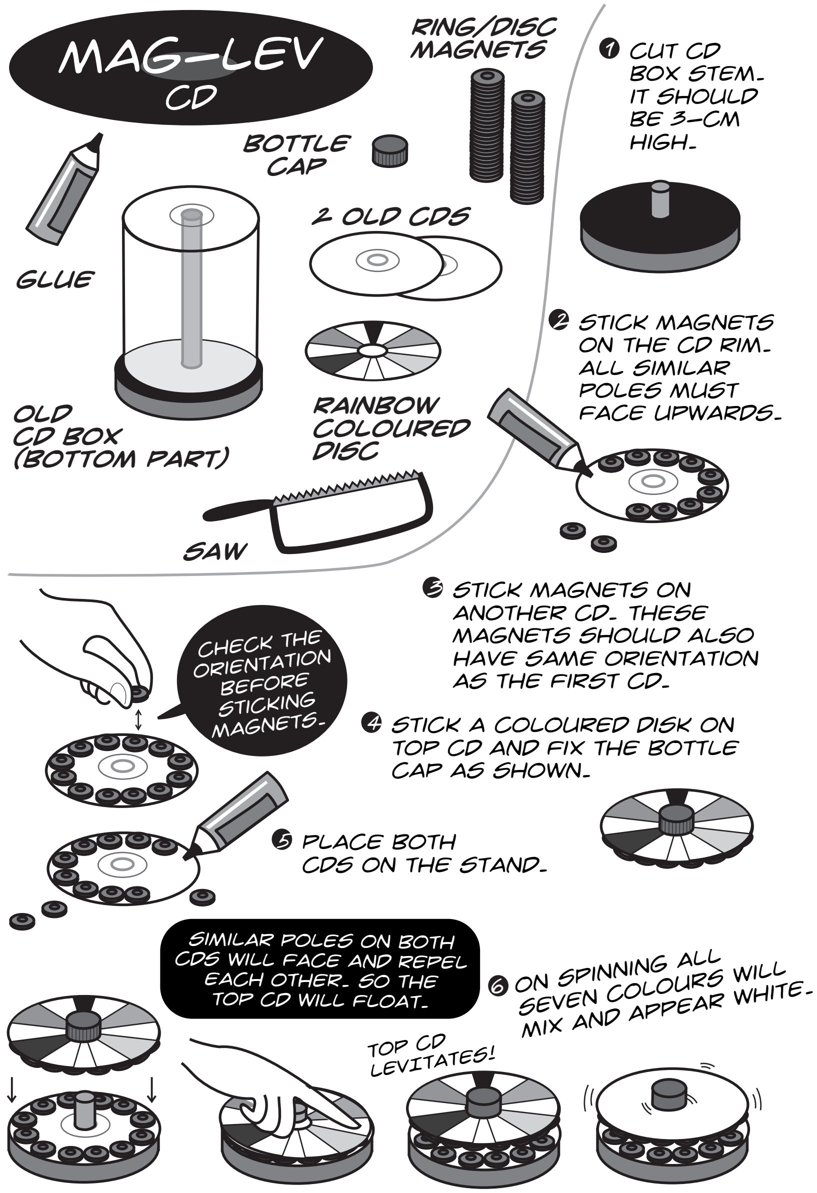
THE BRUSH WILL START VIBRATING, AND THE ANIMAL WILL DANCE!

❹ FIX A CARD HEAD TO MAKE IT LOOK LIKE AN ANIMAL.



IF YOU PLACE IT ON A PLATE... IT WILL GO AROUND AND AROUND.

MAG-LEV CD


RING/DISC MAGNETS
BOTTLE CAP
2 OLD CDS
GLUE
OLD CD BOX (BOTTOM PART)
RAINBOW COLOURED DISC
SAW
CHECK THE ORIENTATION BEFORE STICKING MAGNETS.
SIMILAR POLES ON BOTH CDS WILL FACE AND REPEL EACH OTHER. SO THE TOP CD WILL FLOAT.
TOP CD LEVITATES!

❶ CUT CD BOX STEM. IT SHOULD BE 3-CM HIGH.

❷ STICK MAGNETS ON THE CD RIM. ALL SIMILAR POLES MUST FACE UPWARDS.

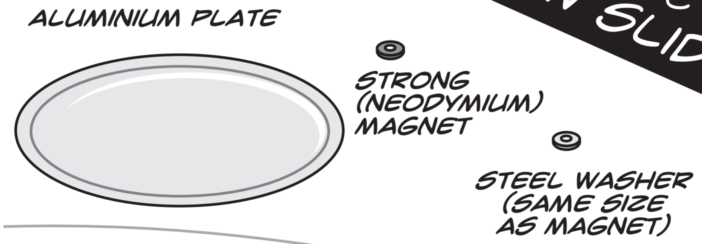
❸ STICK MAGNETS ON ANOTHER CD. THESE MAGNETS SHOULD ALSO HAVE SAME ORIENTATION AS THE FIRST CD.

❹ STICK A COLOURED DISK ON TOP CD AND FIX THE BOTTLE CAP AS SHOWN.

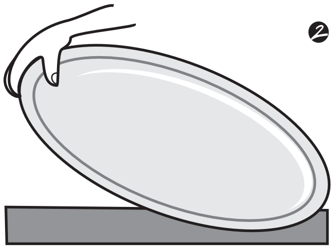
❺ PLACE BOTH CDS ON THE STAND.

❻ ON SPINNING ALL SEVEN COLOURS WILL MIX AND APPEAR WHITE.

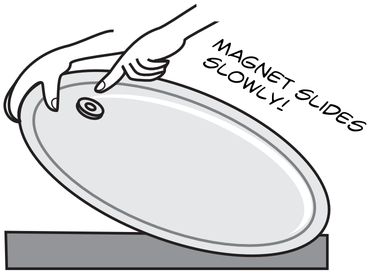
MAGNETIC SLOW SLIDE

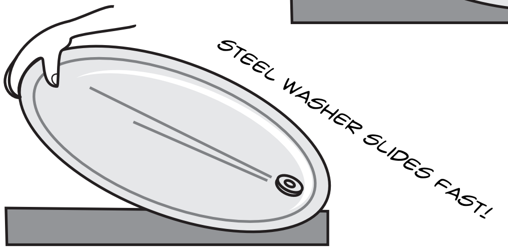


1. HOLD THE ALUMINIUM PLATE AT A SLANT.



2. PLACE THE NEODYMIUM MAGNET ON THE PLATE. BECAUSE OF EDDY CURRENTS IT WILL SLIDE SLOWLY.

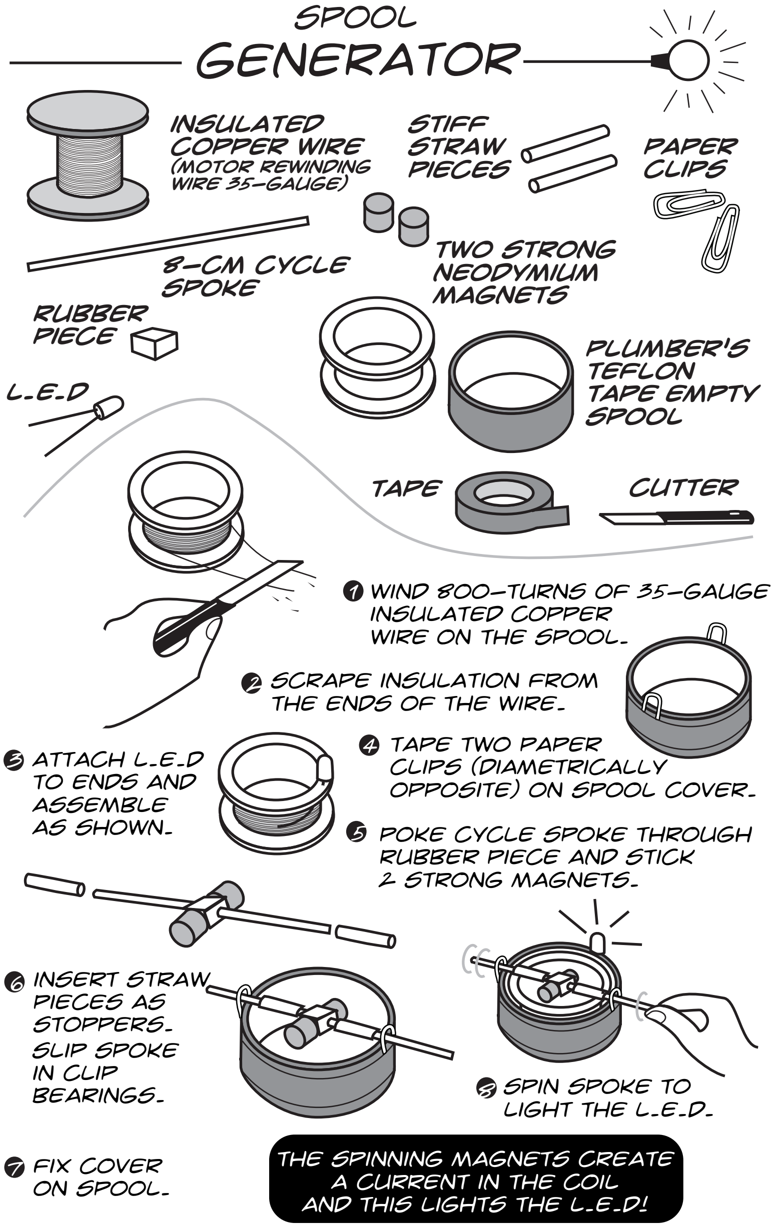

MAGNET SLIDES SLOWLY!


STEEL WASHER SLIDES FAST!

- REPEAT THIS EXPERIMENT WITH A SIMILAR LOOKING STEEL WASHER.

AS THERE ARE NO EDDY CURRENTS, THE STEEL WASHER WILL SLIDE FAST ON THE ALUMINIUM PLATE.

SPOOL GENERATOR

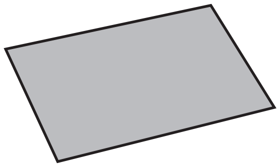

INSULATED COPPER WIRE (MOTOR REWINDING WIRE 35-GAUGE)
STIFF STRAW PIECES
PAPER CLIPS
8-CM CYCLE SPOKE
TWO STRONG NEODYMIUM MAGNETS
RUBBER PIECE
PLUMBER'S TEFLON TAPE EMPTY SPOOL
L.E.D
TAPE
CUTTER

1. WIND 800-TURNS OF 35-GAUGE INSULATED COPPER WIRE ON THE SPOOL.
2. SCRAPE INSULATION FROM THE ENDS OF THE WIRE.
3. ATTACH L.E.D TO ENDS AND ASSEMBLE AS SHOWN.
4. TAPE TWO PAPER CLIPS (DIAMETRICALLY OPPOSITE) ON SPOOL COVER.
5. POKE CYCLE SPOKE THROUGH RUBBER PIECE AND STICK 2 STRONG MAGNETS.
6. INSERT STRAW PIECES AS STOPPERS. SLIP SPOKE IN CLIP BEARINGS.
7. FIX COVER ON SPOOL.
8. SPIN SPOKE TO LIGHT THE L.E.D.

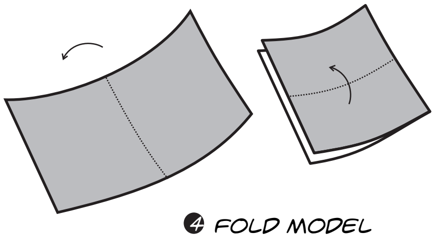
THE SPINNING MAGNETS CREATE A CURRENT IN THE COIL AND THIS LIGHTS THE L.E.D!

PENTAGON

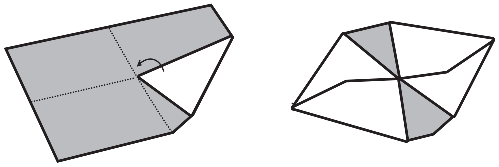
❶ TAKE AN
A–4 SHEET.



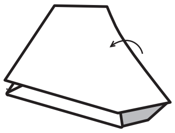
❷ FOLD IN QUARTER
TO LOCATE ITS CENTRE.



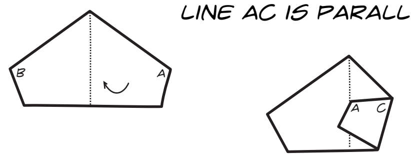
❸ FOLD ALL FOUR
CORNERS TO CENTER.



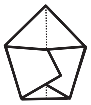
❹ FOLD MODEL
IN HALF.



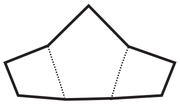
❺ FOLD POINT 'A' TO MIDLINE, SO THAT
LINE AC IS PARALLEL TO THE BASE.



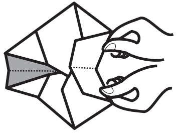
❻ FOLD
BOTH
SIDES.



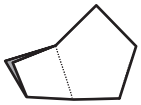
❼ OPEN THE
PENTAGON.



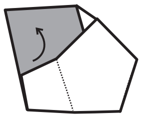
❽ REVERSE FOLD IT.



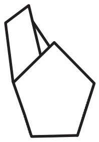
❾ TUCK RIGHT
SIDE IN.



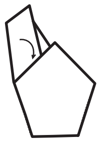
❿ OPEN FLAP
AS SHOWN.



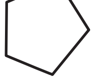
⓫ REVERSE
FOLD IT.

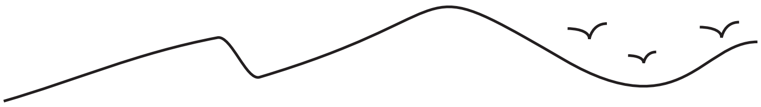


⓬ TUCK THE
FLAP INSIDE...

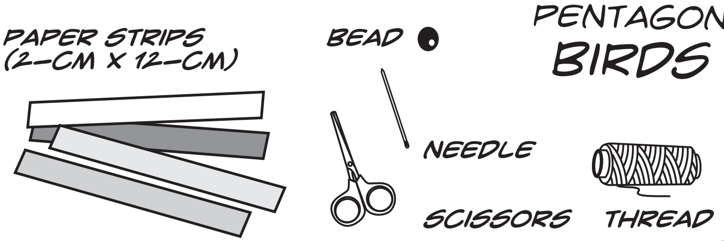


...TO MAKE
A BEAUTIFUL
PENTAGON!

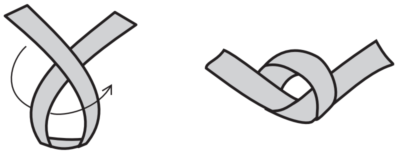




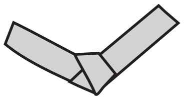
PENTAGON BIRDS



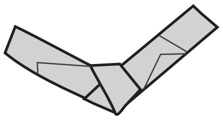
1. HOLD THE TWO ENDS OF A LONG PARALLEL PAPER STRIP AND TIE A SIMPLE KNOT.



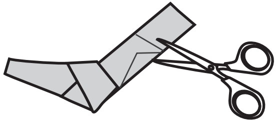
2. GENTLY PULL THE ENDS AND YOU WILL BE SURPRISED TO SEE A PENTAGONAL KNOT IN THE MIDDLE.



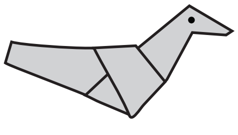
3. MARK A BEAK AND TAIL AS SHOWN.



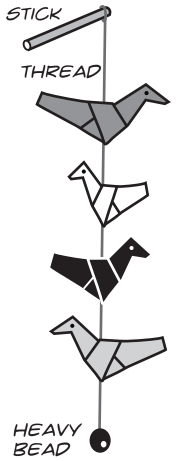
4. CUT ALONG THE MARKED LINES.



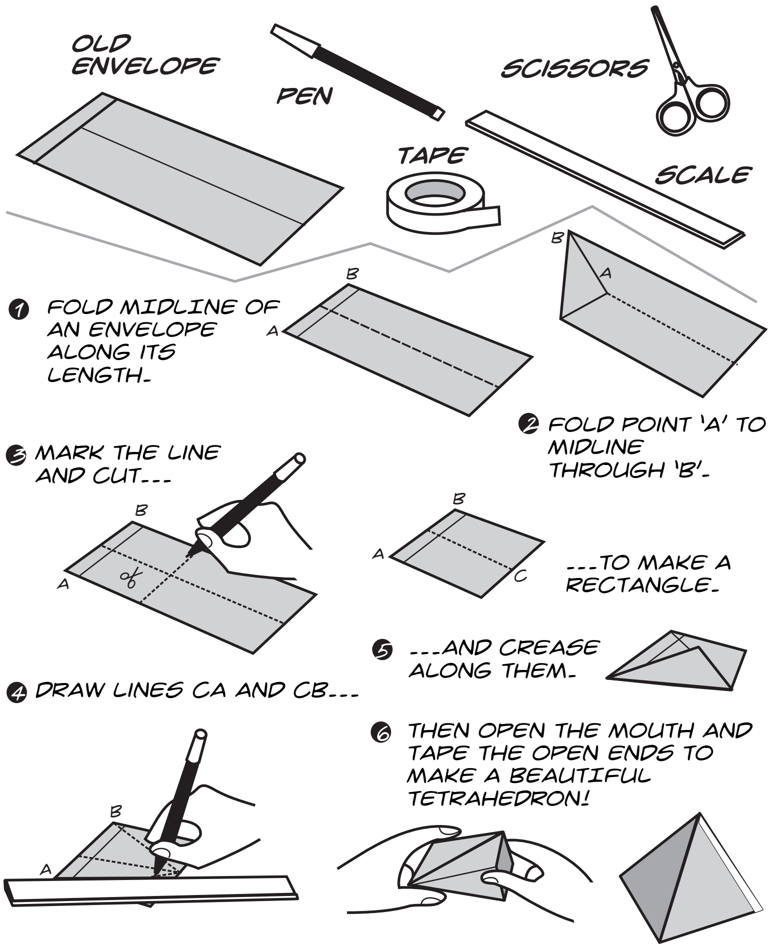
5. DRAW AN EYE AND THE PENTAGON BIRD IS READY!



MAKE MANY COLOURFUL BIRDS. WEAVE THEM ALONG A THREAD TO MAKE A PRETTY WALL HANGING!



ENVELOPE TETRAHEDRON

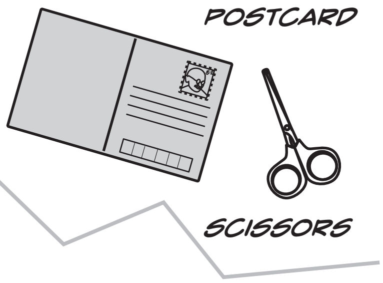


1. FOLD MIDLINE OF AN ENVELOPE ALONG ITS LENGTH.
2. FOLD POINT 'A' TO MIDLINE THROUGH 'B'.
3. MARK THE LINE AND CUT...

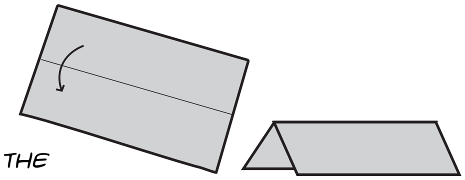
...TO MAKE A RECTANGLE.

4. DRAW LINES CA AND CB...
5. ...AND CREASE ALONG THEM.
6. THEN OPEN THE MOUTH AND TAPE THE OPEN ENDS TO MAKE A BEAUTIFUL TETRAHEDRON!

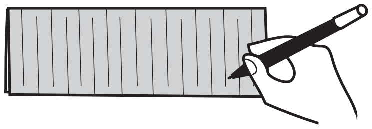
POSTCARD GARLAND



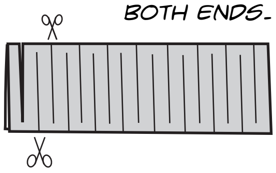
❶ FOLD A POSTCARD IN HALF ALONG ITS LENGTH.



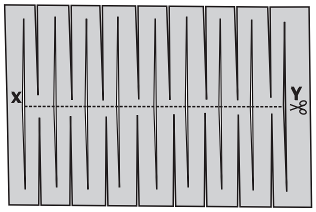
❷ DRAW LINES ALONG THE WIDTH AS SHOWN.

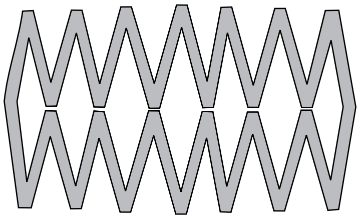


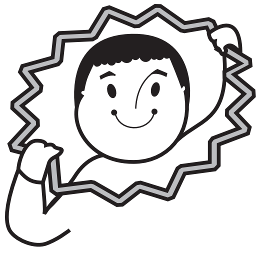
❸ CUT ALONG THE LINES FROM BOTH ENDS.



❹ OPEN POSTCARD AND CUT FROM POINT X TO Y TO GET A CLOSED GARLAND.

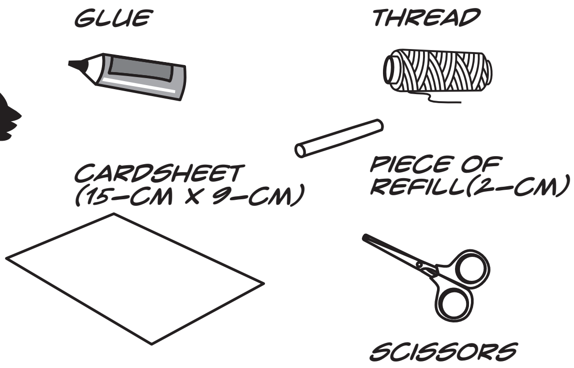




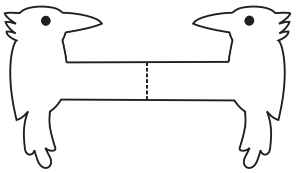


❺ YOU CAN WEAR THIS LARGE GARLAND!

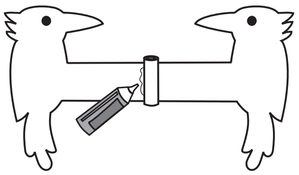
HOPPING BIRD



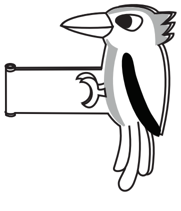
1. DRAW AND CUT THIS DOUBLE BIRD ON A THICK CARDSHEET.



2. STICK A 2-CM LONG EMPTY BALL PEN REFILL PIECE VERTICALLY IN THE MIDDLE.

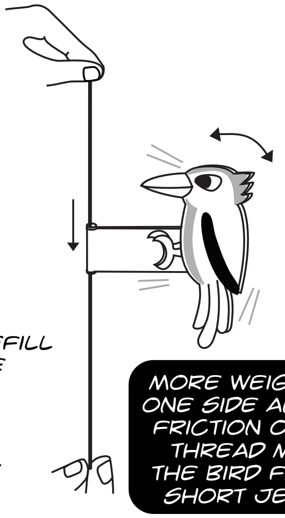


3. APPLY GLUE, DOUBLE FOLD AND STICK THE BIRD. COLOUR THE BIRD.



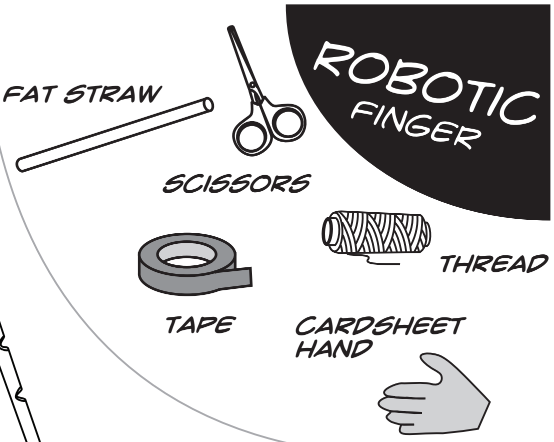
4. WEAVE A THREAD IN THE REFILL AND TIE TWO BEADS ON THE ENDS OF THE THREAD.

5. ON HOLDING THE THREAD TIGHT, THE BIRD WILL COME DOWN IN SHORT JERKS!

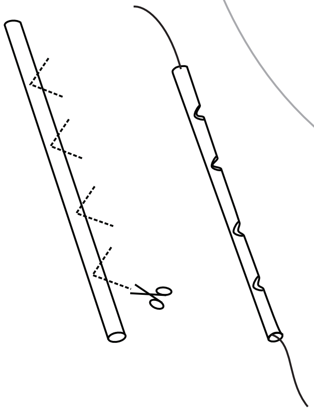


MORE WEIGHT ON ONE SIDE AND THE FRICTION OF THE THREAD MAKE THE BIRD FALL IN SHORT JERKS.

ROBOTIC FINGER

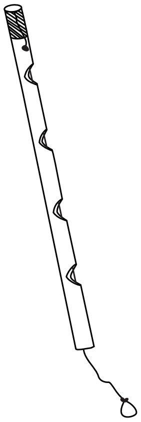


1. CUT FOUR 'V'-SHAPED NOTCHES IN A FAT PLASTIC STRAW.

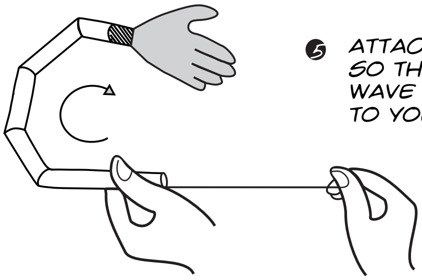


2. WEAVE THIN THREAD THROUGH THE STRAW.

3. TAPE ONE END OF THE THREAD TO TOP END OF THE STRAW. TIE A LOOP AT THE OTHER END.

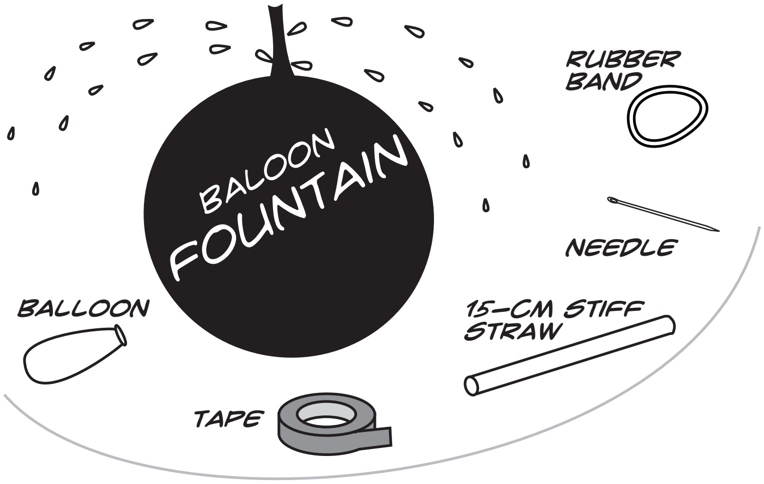


4. HOLD THE STRAW WITH ONE HAND AND PULL THE LOOP WITH THE OTHER TO MAKE THE ROBOTIC FINGER CURL. RELEASE BEAD TO STRAIGHTEN THE STRAW.

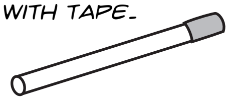


5. ATTACH A CARD HAND SO THAT YOU CAN WAVE A GOOD-BYE TO YOUR FRIENDS.

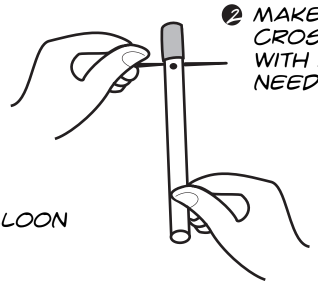
BALOON FOUNTAIN



❶ SEAL ONE END OF THE STIFF STRAW WITH TAPE.

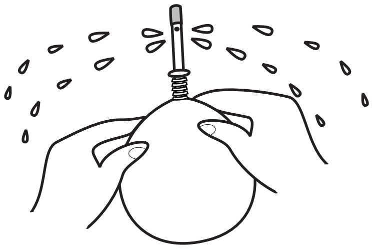


❷ MAKE FOUR CROSS HOLES WITH A LONG NEEDLE.



❸ FILL THE BALLOON WITH WATER.

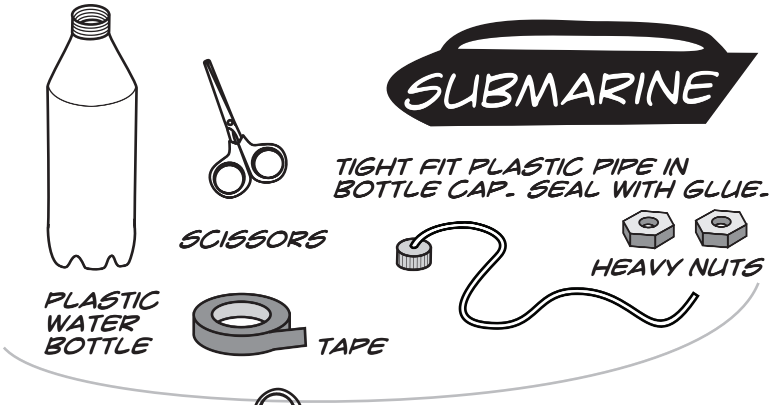
❹ FIX STRAW TO THE BALLOON WITH A RUBBER BAND.



WATER WILL AUTOMATICALLY SQUIRT OUT LIKE A FOUNTAIN FROM THE STRAW.

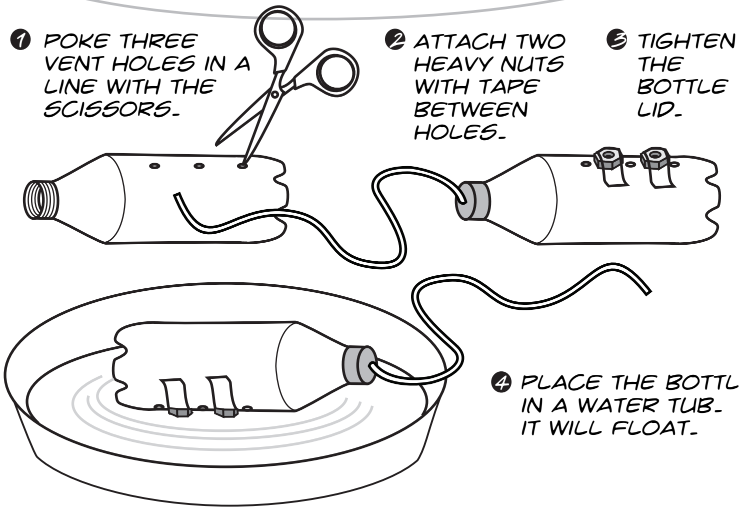
AS THE BALLOON SHRINKS, WATER IS FORCED OUT OF THE STRAW HOLES.

SUBMARINE

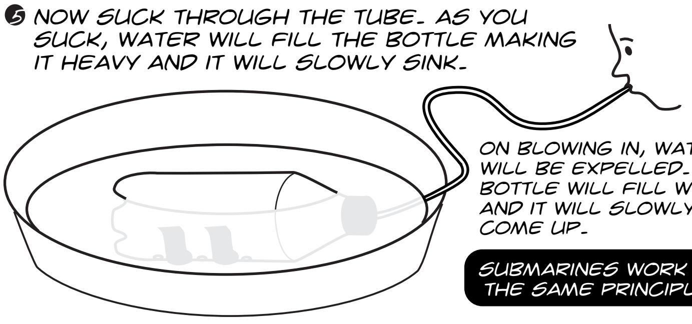


TIGHT FIT PLASTIC PIPE IN BOTTLE CAP. SEAL WITH GLUE.

1. POKE THREE VENT HOLES IN A LINE WITH THE SCISSORS.
2. ATTACH TWO HEAVY NUTS WITH TAPE BETWEEN HOLES.
3. TIGHTEN THE BOTTLE LID.



4. PLACE THE BOTTLE IN A WATER TUB. IT WILL FLOAT.
5. NOW SUCK THROUGH THE TUBE. AS YOU SUCK, WATER WILL FILL THE BOTTLE MAKING IT HEAVY AND IT WILL SLOWLY SINK.

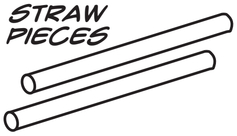


ON BLOWING IN, WATER WILL BE EXPELLED. THE BOTTLE WILL FILL WITH AIR AND IT WILL SLOWLY COME UP.

SUBMARINES WORK ON THE SAME PRINCIPLE.

STRAW SPRAY

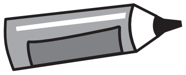
TWO FAT STRAW PIECES



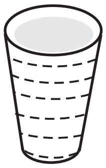
PIECE OF RUBBER

STYROFOAM BALLS

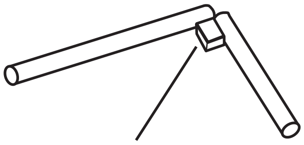
RUBBER GLUE



GLASS FULL OF WATER

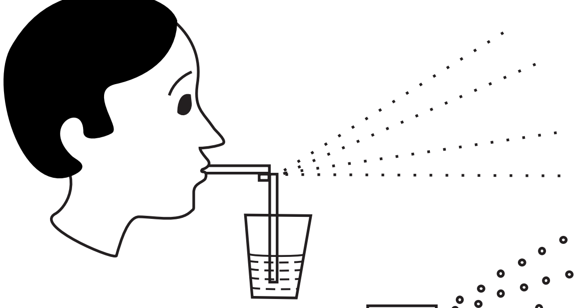


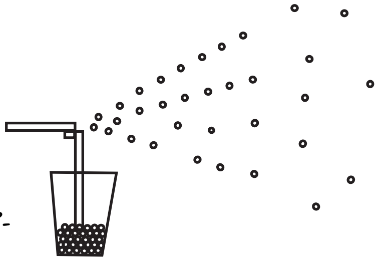
❶ JOIN TWO FAT
STRAWS AT
90-DEGREES TO
MAKE A SPRAY PIPE.



❷ STICK A RUBBER
PIECE FOR SUPPORT.
THIS WILL KEEP
THE STRAWS
AT RIGHT ANGLES.

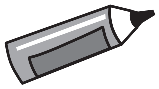
❸ DIP ONE
END IN WATER
AND BLOW.
WATER SPRAY WILL
COME OUT LIKE A MIST!





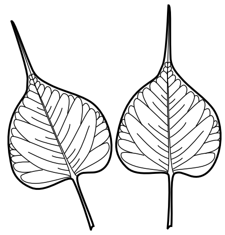
USE A FAT STRAW TO
SPRAY STYROFOAM
BALLS INSTEAD OF WATER.

LEAF CAT

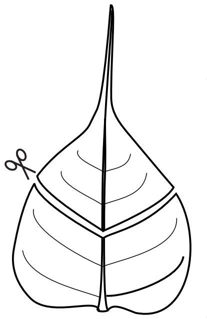


RUBBER GLUE

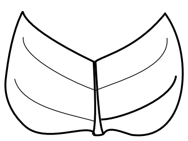
SCISSORS



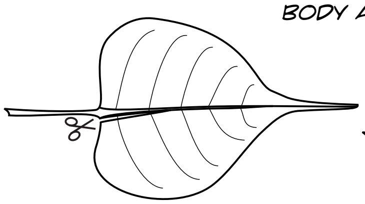
TWO PEEPAL (FICUS RELIGIOSA) LEAVES

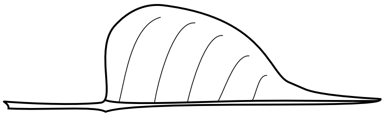


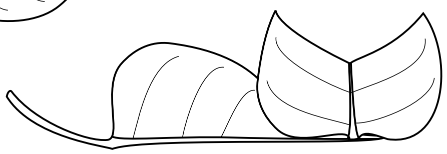
❶ MAKE TWO SLANT CUTS ON THE FIRST HEART SHAPED LEAF TO MAKE THE CAT'S FACE.



❷ CUT THE SECOND LEAF ALONG THE MIDRIB. HALF THE LEAF ALONG WITH ITS STEM WILL MAKE THE CAT'S BODY AND THE TAIL.

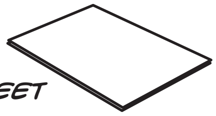


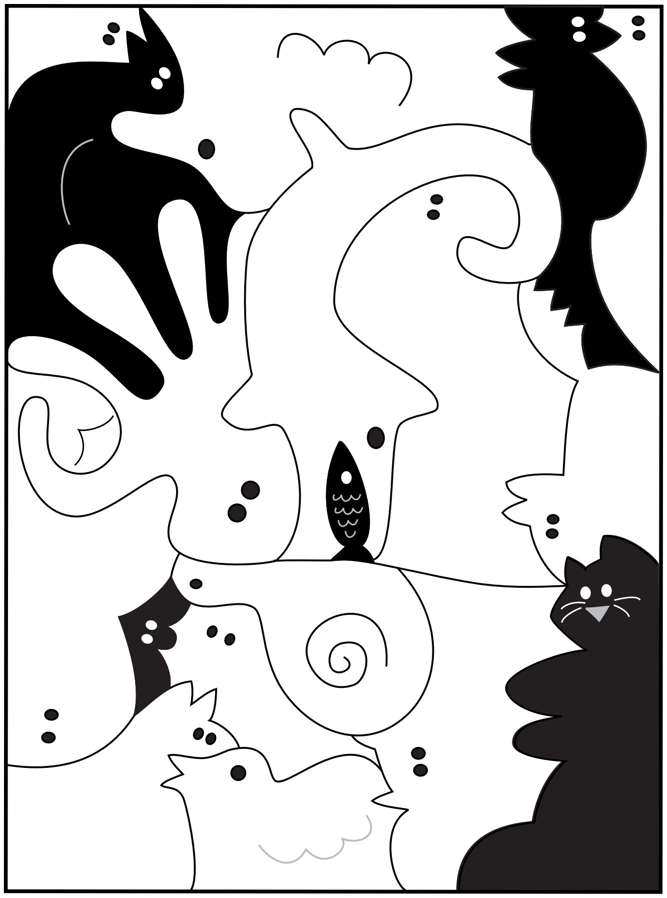




❸ STICK THE TWO PIECES TO MAKE THE LEAF CAT.

ANIMAL JIGSAW





① DRAW 18 ANIMALS ON A THICK CARDBOARD OR PLYWOOD. THEN CUT THEM WITH A CRAFT KNIFE OR A FRET SAW. YOU CAN STAND THESE ANIMALS INDIVIDUALLY TO MAKE A ZOO OR SNUG THEM TOGETHER INTO A JIGSAW.

TOYS FROM TRASH

Our consumerist society produces
lots of junk. Products are often over
packaged – sometimes with multiple
layers of covering. Every day billions of
plastic bottles, tetrapacks, cardboard
cartons, wrappers and paper sheets
are thrown away. By collecting some of
this junk children can help clean up
the earth. They can make delightful
toys out of this throwaway trash
and in the process learn
a lot of good science.

ARVIND GUPTA